CERAMIC ABSTRACTS and THE BULLETIN

AMERICAN CERAMIC SOCIETY

JANUARY 15, 1943

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

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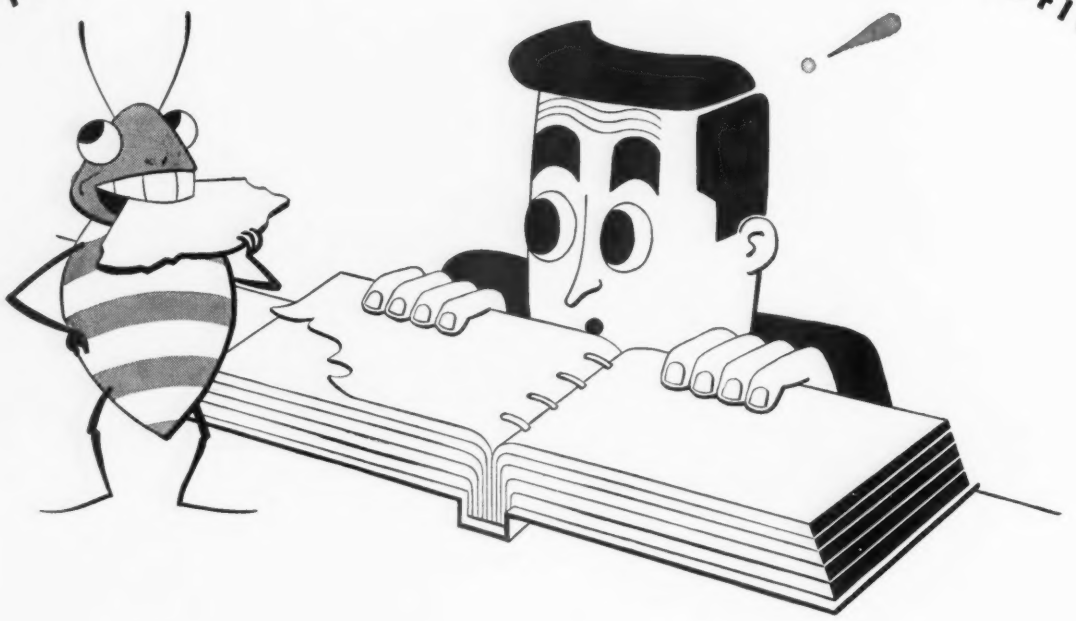

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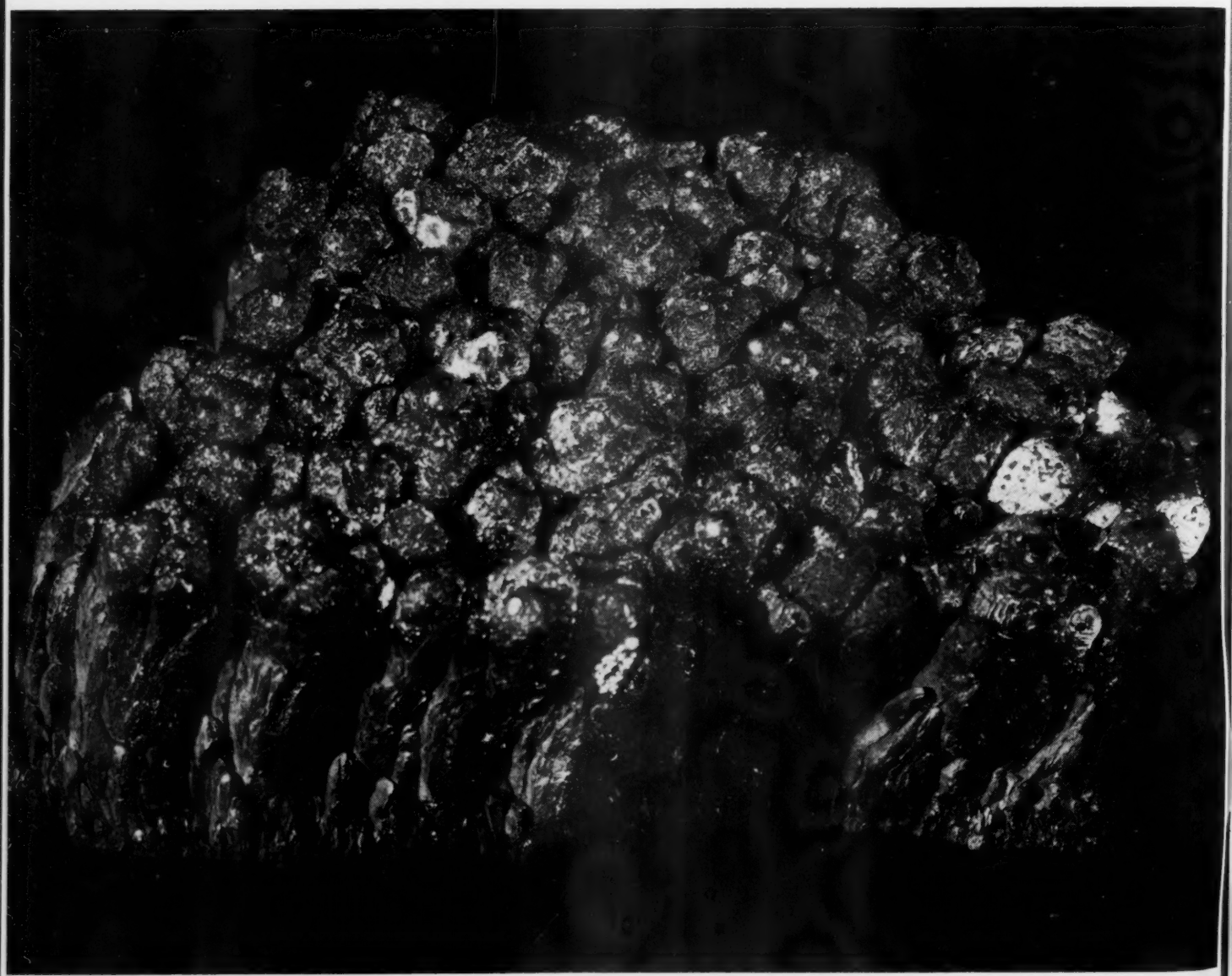

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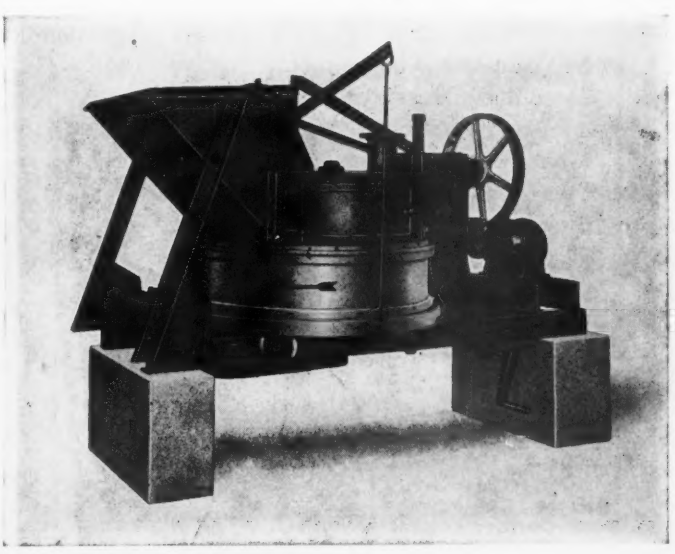

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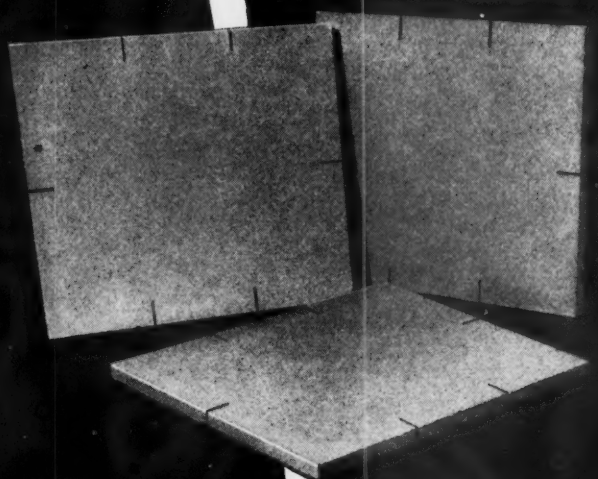

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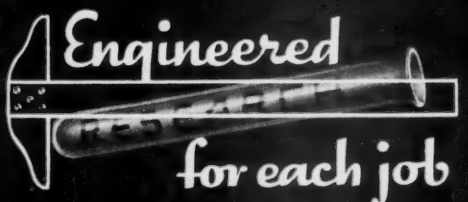

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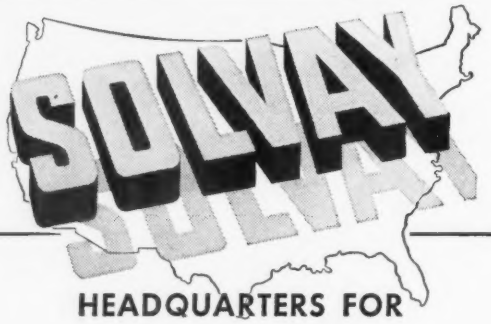

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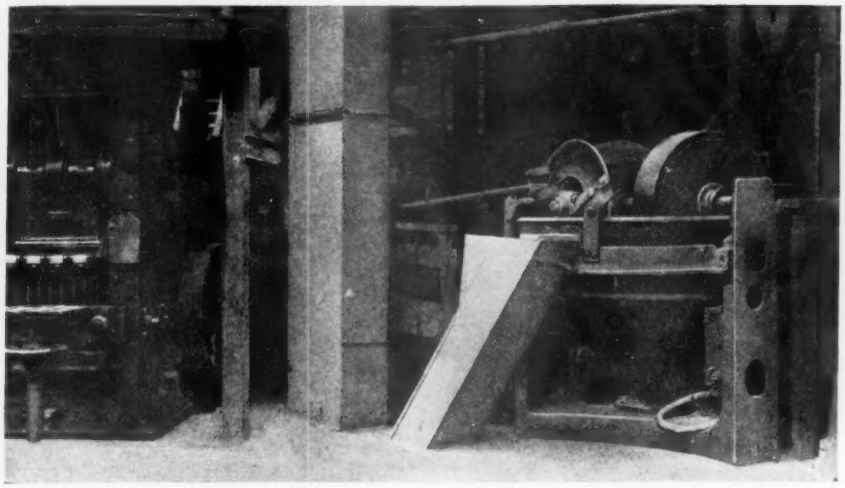

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Compiled by

THE AMERICAN CERAMIC SOCIETY

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JOURNAL REFERENCE: The journal name appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 22 **January 15, 1943** **No. 1**

Abrasives

Corundum search in North Carolina. ANON. *Bull. Amer. Ceram. Soc.*, **21** [11] 302 (1942).

Grinding wheel marking system. ANON. *Amer. Machinist*, **86** [19] 1041 (1942).—The Grinding Wheel Manufacturers Assn. has adopted a standard system for marking grinding wheels which gives essential data in proper sequence: (1) Abrasive, represented by letters: A, Al oxide, regular; B, Al oxide, refined; AB, a mixture of regular and refined Al oxide or semifriable abrasives; C, silicon carbide, regular; CG, silicon carbide, refined; D, corundum; E, emery; F, garnet. (2) Grain size, e.g., 8, 10, 12, 14, 16 . . . 320, 400, 500, 600, etc. (3) Hardness or grade: soft, S1 to S7; medium, M1 to M7; hard, H1 to H7. (4) Structure, represented by numbers as follows:

Preferred numbers	2	5	8
Available numbers	1 3	4 6	7 9

No. 1 is the most dense, No. 5 is medium, and No. 9 is the most open. (5) Bond or process, represented by a letter: V, vitrified; E, shellac or elastic; B, resinoid (synthetic resins such as Bakelite, etc.); S, silicate; R, rubber; O, oxychloride. (6) Manufacturer's records, represented by a symbol. Examples of marking are explained.

M.HA.

Integral dust-control units for portable grinders. ANON. *Can. Machinery*, **53** [10] 98 (1942).—Self-contained workbenches which feature integral dust control, for use in connection with portable grinding operations, are described. Illustrated. E.D.M.

New conception in tool grinding. ANON. *Iron Age*, **149** [21] 39–41 (1942).—For uniform life over the entire cutting edge of the tool, the tool should be provided with constant relief in the direction of feed. A new grinder (the Bura-Way) grinds the profile of a tool in one operation, regardless of the number of radii involved. Primarily designed for precise grinding of high-speed and cast-chromium cobalt cutting metals, it is equally efficient in grinding carbide-tipped tools. Grinding is done on the face rather than on the periphery of the wheel.

E.H.McC.

Should carbide tools be ground dry or wet? J. R. LONGWELL. *Can. Machinery*, **53** [10] 142, 144 (1942).—It is entirely feasible to grind carbide tools satisfactorily by either method. The major advantages and disadvantages of both methods are listed. The Carboloy Co., Inc., uses dry grinding for hand grinding and the wet method for machine grinding. The difficulty of applying wet grinding to the refinishing of carbide tools on hand grinders lies primarily in the quantity of water used. The tendency is for the operator to use too little water to keep from getting wet; this is worse than none at all, as tools ground with too little water will not stand up. A procedure for wet or dry hand grinding of carbide tools is recommended. E.D.M.

PATENTS

Abrading device. K. W. CONNOR (Micromatic Hone Corp.). U. S. 2,302,105, Nov. 17, 1942 (April 27, 1936; May 1, 1939).

Abrasive article. A. W. WALKER (Carborundum Co.). Can. 406,207, July 21, 1942 (May 12, 1941). G.M.H.

Abrasive-coated paper and process of producing. A. H. STEVENS (Durex Corp.). Brit. 548,379, Oct. 21, 1942 (Sept. 21, 1940).

Abrasive grain. A. A. KLEIN (Norton Co.). U. S. 2,301,123, Nov. 3, 1942 (July 2, 1941).—As a new article of manufacture, a single discrete abrasive grain, unbonded to other abrasive grains, consisting of crystalline alumina coated with an alkaline earth metal sulfate. **U. S. 2,303,284,** Nov. 24, 1942 (June 26, 1940).—A composite particle consisting of a substantial quantity of cryolite bonded to a single granule of crystalline alumina by means of heat-set sodium silicate, the single granule of crystalline alumina being unbonded to any other granule of the same or other substance except the substantial quantity of cryolite.

Abrasive material. C. L. NORTON, JR. (Babcock & Wilcox Co.). Can. 407,080, Sept. 1, 1942 (Feb. 6, 1940). G.M.H.

Abrasive tools. J. K. SMIT & SONS, INC., AND P. L. KUZMICK. Brit. 548,536, Oct. 28, 1942 (April 10, 1941).

Abrasive tools and method of producing. J. K. SMIT & SONS, INC., AND P. L. KUZMICK. Brit. 547,752, Sept. 23, 1942 (April 28, 1941).

Centerless grinding machine. LIDKOPINGS MEKANISKA VERKSTADS AKTIEBOLAG. Brit. 547,556 and 547,557, Sept. 16, 1942 (Nov. 4, 1939).

Coated abrasives. N. E. Oglesby and Franklin Strain (Behr-Manning Corp.). U. S. 2,302,711, Nov. 24, 1942 (Feb. 6, 1937).

Composition for use in the manufacture of grinding materials. Titanium Alloy Mfg. Co. Brit. 548,238, Oct. 14, 1942 (Oct. 11, 1940).

Floor grinder. A. W. Mall. U. S. 2,301,164, Nov. 3, 1942 (May 13, 1940).

Grinding apparatus. Paul Cüppers and Friedrich Stein (vested in the Alien Property Custodian). U. S. 2,301,111, Nov. 3, 1942 (Jan. 4, 1939).

Grinding machine. Bryant Chucking Grinder Co. Brit. 547,731, Sept. 23, 1942 (Oct. 30, 1939). J. C. Cantley (United Shoe Machinery Corp.). U. S. 2,299,126, Oct. 20, 1942 (Aug. 1, 1940). Norton Co. Brit. 548,640, Oct. 28, 1942 (Dec. 17, 1940). H. A. Silven (Norton Co.). U. S. 2,302,915, Nov. 24, 1942 (March 27, 1940; July 5, 1940).

Grinding machine. C. G. Flygare (Norton Co.). Can. 407,137, Sept. 1, 1942 (Sept. 27, 1940). J. I. Garside (Norton Co.). Can. 407,141, Sept. 1, 1942 (April 15, 1941; in U. S. June 19, 1940). G. T. Muskovin (Norton Co.). Can. 407,140, Sept. 1, 1942 (April 12, 1941; in U. S. May 23, 1940). H. A. Silven (Norton Co.). Can. 407,138, Sept. 1, 1942 (March 26, 1941; in U. S. March 27, 1940). G.M.H.

Grinding and polishing apparatus. A. E. Hamilton. U. S. 2,302,120, Nov. 17, 1942 (March 7, 1941).

Grinding tools for dental purposes. J. H. Onions. Brit. 548,578, Oct. 28, 1942 (July 12, 1941).

Grinding wheel. S. S. Kistler (Norton Co.). Can. 405,950, July 7, 1942 (Jan. 25, 1940; in U. S. Jan. 28 and Nov. 28, 1939). Can. 407,444, Sept. 15, 1942 (April 12, 1941; in U. S. April 29, 1940). G.M.H.

Grinding-wheel dressing. F. P. Hegeman (General Motors Corp.). U. S. 2,298,762, Oct. 13, 1942 (March 13, 1941).

Grinding-wheel dressing attachment. J. E. O'Neill. U. S. 2,302,712, Nov. 24, 1942 (Oct. 29, 1940).

Grinding-wheel sleeve assembly. L. J. Lalime (Brown and Sharpe Mfg. Co.). U. S. 2,301,055, Nov. 3, 1942 (Aug. 28, 1942).

Grinding-wheel truing mechanism. Jones & Lamson Machine Co. Brit. 548,351, Oct. 21, 1942 (April 4, 1940).

Knife-sharpening mechanism for cutting machines. F. J. Clark and C. F. Hilgeman (Eastman Machine Co.). U. S. 2,300,534 and 2,300,535, Nov. 3, 1942 (May 1, 1941).

Lapping carrier. F. R. Hensel, E. I. Larsen, and O. L. Fluharty (P. R. Mallory & Co., Inc.). U. S. 2,300,118, Oct. 27, 1942 (Sept. 10, 1940).

Lapping machines more especially for surfaces in high precision instruments. Sperry Gyroscope Co., Inc. Brit. 548,415, Oct. 21, 1942 (Nov. 30, 1939).

Lapping tool. L. F. Glaude. U. S. 2,298,367, Oct. 13, 1942 (June 15, 1942).

Licker grinder. J. F. Lehman (Felton Wimberly, Jr.). U. S. 2,301,058, Nov. 3, 1942 (July 23, 1940).

Machine for grinding threads. Fernand Turrettini (Soc. Genevoise d'Instruments de Physique). U. S 2,303,008, Nov. 24, 1942 (March 28, 1941).

Machine tool. B. P. Graves and H. C. Weimar (Brown and Sharpe Mfg. Co.). U. S. 2,299,817, Oct. 27, 1942 (Oct. 7, 1939).

Manufacture of articles composed of granular material held in a bond. Carborundum Co. Brit. 547,562, Sept. 16, 1942 (March 28, 1940).

Method of purifying crystalline alumina and an abrasive material made thereby. R. R. Ridgway (Norton Co.). U. S. 2,301,706, Nov. 10, 1942 (Nov. 2, 1939).

Polishing machine. D. E. Mulholland. U. S. 2,301,069, Nov. 3, 1942 (Nov. 30, 1939).

Rifle barrel lapping machine. Andrew Raiche. U. S. 2,298,775, Oct. 13, 1942 (May 16, 1941).

Trimmer mechanism for grinding machines. S. G. Brady (Gear Grinding Machine Co.). U. S. 2,301,610, Nov. 10, 1942 (March 3, 1941).

Truing devices for grinding machines. Bryant Chucking Grinder Co. Brit. 547,762, Sept. 23, 1942 (Oct. 30, 1939); divided out of Brit. 547,731 (see "Grinding machine," this page).

Truing mechanism. E. F. Render (Cincinnati Grinders, Inc.). U. S. 2,301,582, Nov. 10, 1942 (Sept. 11, 1941).

Wheel dressing. J. P. Murray. U. S. 2,300,431, Nov. 3, 1942 (Oct. 3, 1941).

Art and Archeology

All-tile mural for NBC building. Anon. *Ceram. Age*, **39** [3] 76–78 (1942).—11 photos. See *Bull. Amer. Ceram. Soc.*, **21** [2] 33 (1942). F.G.H.

Ceramicenter. Anon. *Bull. Amer. Ceram. Soc.*, **21** [11] 301 (1942).

Ceramics in NYA: a war emergency. Alice Josephine Gitter. *Bull. Amer. Ceram. Soc.*, **21** [10] 235–37 (1942).—4 photographs.

Colored glazes. W. B. *Keram. Rundschau*, **45** [23] 250–52 (1937).—Tables give the compositions of a clear transparent glaze; colored fritted glazes with Ni, Cu and Mn, and Fe and Co; coloring mixtures; and mat glazes. Although colored glazes do not require special raw materials or frits, difficulties are encountered in their production which are due chiefly to faulty preparation (milling), the use of the pure oxides or their salts, and reactions occurring during firing. These difficulties may be overcome by the use of fritted glazes which have been thoroughly mixed and fired at sufficiently high temperatures and suitably ground and by care in milling and preparing the glazes, suggestions for which are presented. M.V.C.

Decoration of pottery. A. Bernard Hollowood. *Ind. Chemist*, **17** [200] 225–26 (1941).—The progress of the pottery industry is now closely related to the researches of the color chemist. One of the oldest methods of embellishing pottery is scratching or incising with a fine hard point. The scratched line raises a burr in the clay surface to act as a *cloison*, confining the underglaze coloring material to the incision. Even volatile stains such as manganese and cobalt blue are held in place by this method Sprigged ware, e.g., Wedgwood jasper, is decorated with bats of molded clay. Originally, powdered minerals were used for coloring, but the first great advance in color chemistry is concerned with the purification of the pigmentary materials. The impure minerals are still used for crude earthenware. Cobalt oxide is the most widely used of all metallic colorants, and it provides the potter with an immense range of tints. It is indestructible by ceramic fire. The preparation of many pure ceramic colors is described. Copper oxide is somewhat limited in its application, as it cannot be subjected to great heat. In the coloring of glazes, however, it is extremely versatile. With lead, it affords a variety of greens and with alkalis, a fine turquoise blue. Antimony oxide is colorless, but with lead it gives yellow; an admixture of chrome produces light green, and the addition of iron produces orange. These colors are subjected to varying degrees of heat. They may be used to color a clay body or a covering slip, in which case they must withstand the biscuit fire (1200° to 1450°C.); they may be required to pigment glazes or underglaze decorations, undergoing the fire of the glost furnace (1000° to 1300°C.); or they may be used for overglaze patterns (700° to 900°C.). The application of

colored designs to pottery is reviewed briefly. See "Glazing . . .," *Ceram. Abs.*, **21** [11] 228 (1942); "Firing . . .," this issue, p. 16. E.D.M.

Early Chinese pottery. HOWARD HOLLIS. *Ceram. Age*, **36** [6] 167–68 (1940).—Early Chinese ware recently acquired by the Cleveland Museum of Art is described and illustrated. F.G.H.

Early glass from the Midwest. MARSHALL DAVIDSON. *Bull. Metropolitan Mus. Art*, **38** [6] 162–63 (1942).—Although the rapid rise of industrialism in the Midwest hindered the natural development of most handcraft traditions brought from the East and from Europe, the art of glass blowing is a notable exception. Much colorful and skillfully made glassware was blown in this district. The Museum has just added five splendid examples to a small select group acquired earlier. These include a bowl with welted rim, petaled foot, and deep sea-green fabric, which resembles a few others from eastern Ohio, possibly Zanesville; a handsome amethyst creamer, probably from the Pittsburgh region; and a pattern-molded olive-amber globular bottle similar to the ribbed flasks blown at Mantua during the 1820's. There is also a chestnut flask, molded and expanded from yellow-green metal, with a quilted pattern (probably from Zanesville), and a shallow bowl of clear amber glass, with graduated swirled molding, a fine specimen from a limited group. See "Recent . . .," *Ceram. Abs.*, **20** [10] 231 (1941). A.A.A.

English and American ceramic design problems. THOMAS S. HAILE. *Bull. Amer. Ceram. Soc.*, **21** [12] 317–20 (1942).—4 references.

Gift of porcelain. C. LOUISE AVERY. *Bull. Metropolitan Mus. Art*, **38** [6] 163–64 (1942).—Twelve more examples of 18th century Worcester porcelain from the Lockwood collection have been received. One of the most important pieces is a large jug with decoration typically influenced by Meissen, presumably dating from about 1760. A large dish decorated with a scene from Aesop's Fables is illustrated. Four reproductions of Worcester, probably made by Samson of Paris, are included in the group. These examples placed side by side with original Worcester should prove valuable for study purposes. Mr. and Mrs. Lockwood have also presented to the Museum a pair of large covered vases made at the Buen Retiro factory near Madrid in the late 18th century. When Charles III, King of Naples, ascended the throne of Spain in 1759, he moved his Capo di Monte factory to Buen Retiro where he continued it until his death in 1789. This pair of vases is of added interest because of the small output of the factory. See "Worcester . . .," *Ceram. Abs.*, **19** [5] 105 (1940). A.A.A.

Making pottery at Oaxaca, Mexico. ANON. *Ceram. Age*, **36** [6] 172–73 (1940).—Two pages of illustrations are presented. F.G.H.

New decorative ceramics. M. H. SCHILLING. *Keram. Rundschau*, **45** [36] 410–12 (1937).—Human figures, animals, and groups are modeled in slight relief and then cut in sections in the manner of stained-glass windows; the sections are then glazed and fired. The fired sections are jointed together again with gypsum or mortar. Some of the ornamental plaques for buildings and dwellings designed by Rudolf Lunghard, who developed this technique, are shown. M.V.C.

New pots from the old clays of the West. GLEN LUKENS. *Bull. Amer. Ceram. Soc.*, **21** [10] 237–38 (1942).

Photoelectric tristimulus colorimetry with three filters. R. S. HUNTER. *Jour. Optical Soc. Amer.*, **32**, 509–38 (1942).—H. describes a 3-filter method for approximate photoelectric tristimulus colorimetry, mainly applied to surface colors. Such measurements are found to be well suited to a comparison of the colors of spectrally similar specimens, e.g., near-white porcelain enamels. In commerce the measurements may be useful (1) in the day-to-day control of the colors of materials in production, (2) in obtaining compliance of materials with color-tolerance requirements, (3) in making modifications of color to produce matches, and (4) in measuring color changes accompanying fading. See "Symposium . . .," *Ceram. Abs.*, **21** [3] 57 (1942). A.P.

Frederick Hurten Rhead. ANON. *Bull. Amer. Ceram. Soc.*, **21** [12] 305–307 (1942).

Set a pretty table. MARY DAVIS GILLIES. *McCall's Mag.*, **70** [3] 55 (1942).—Eleven patterns of American dinnerware, retailing at 49c to $6.50 per plate, are shown. So wide is the range of types that it is hard to imagine a taste unable to be suited with an American product. Brown tableware is high-lighted as a new style. Two examples are shown: an underglaze lily pattern in yellow and brown earthenware for informal luncheons and dinners and a severely simple brown-bordered beige service plate with a gold edge for formal tables. Green is represented by wreath-edged earthenware for use on mahogany tables, with white, green, or yellow cloths. The durability of American ware is stressed.

Story of John Goodwin, pioneer potter. LUCILLE T. COX. *Bull. Amer. Ceram. Soc.*, **21** [11] 241–47 (1942).—4 photographs.

Terra-cotta plaques from early Attic tombs. G. M. A. RICHTER. *Bull. Metropolitan Mus. Art*, [N.S.] **1** [1] 80–92 (1942).—It is believed that the tablelike sun-dried brick structures found in several cemeteries in Attica are early Attic tombs and that numerous terra-cotta plaques decorated with warlike and funerary scenes must have once decorated these tombs. No tomb has been found with these slabs actually in place, but much evidence seems to establish the fact that they were used in this way. R. discusses examples owned by the Boston Museum and three in the Metropolitan Museum collections. Illustrated. A.A.A.

Transferring the Dresden porcelain collection to a palace. ERNST ZIMMERMANN. *Keram. Rundschau*, **45** [24] 264–65 (1937).—Suitable housing for the Dresden porcelain collection has been a problem ever since the time of King August the Strong, who undertook the building of a "Porcelain Palace." The collection is being rearranged under the direction of Fritz Fichtner. See "Destiny . . . ," *Ceram. Abs.*, **21** [5] 96 (1942). M.V.C.

PATENTS

Casserole. A. M. WEIS. U. S. 2,298,814, Oct. 13, 1942 (Jan. 25, 1939).

Color-control apparatus. A. MCK. GREAVES-WALKER (Libbey-Owens-Ford Glass Co.). U. S. 2,302,763, Nov. 24, 1942 (March 24, 1939).

Decalcomania transfer. BENJAMIN ASNES (Dennison Mfg. Co.). Can. 406,063, July 14, 1942 (Jan. 5, 1939). G.M.H.

Designs for:

Casserole. THOMAS KAPNER AND DAVID KAMENSTEIN. U. S. 134,334, Nov. 17, 1942 (Aug. 19, 1942).

Coffeemaker. KARL SCHNEIDER (Sears, Roebuck and Co.). U. S. 134,169, Oct. 27, 1942 (Feb. 26, 1942).

Coffeepot. KARL SCHNEIDER (Sears, Roebuck and Co.). U. S. 134,168, Oct. 27, 1942 (Feb. 26, 1942).

Condiment holder. A. J. FLAUDER (Weidlich Bros. Mfg. Co.). U. S. 134,112 and 134,113, Oct. 20, 1942 (June 27, 1942).

Cooking vessel. KARL SCHNEIDER (Sears, Roebuck and Co.). U. S. 134,165 and 134,166, Oct. 27, 1942 (Feb. 26, 1942).

Double boiler. KARL SCHNEIDER (Sears, Roebuck and Co.). U. S. 134,167, Oct. 27, 1942 (Feb. 26, 1942).

Lamp lens. ROBERT CADWALLADER (Chrysler Corp.). U. S. 134,349 and 134,350 to 134,353, Nov. 17, 1942 (Feb. 18, 1942). R. D. MILLER (Chrysler Corp.). U. S. 134,354, Nov. 17, 1942 (Feb. 18, 1942).

Luminaire for blackout lighting. T. W. ROLPH (Holophane Co., Inc.). U. S. 134,355, Nov. 17, 1942 (Sept. 10, 1942).

Cements

Activation of acid blast-furnace slags and the production of clinkerless cement. P. P. Budnikov and V. K. Guzev. *Compt. Rend. Acad. Sci. U.R.S.S.*, **28** [8] 712–14 (1940); *Khim. Referat. Zhur.*, **4** [3] 88 (1941).—Experiments showed that a clinkerless cement with considerable mechanical strength can be produced from acid blast-furnace slags using, as activator, $CaSO_4$ combined with CaO and MgO. Good results can also be obtained by using, as activator, $CaSO_4$ combined with dolomite, decarbonized $MgCO_3$, or decarbonized $CaCO_3$. The decarbonization was effected by heating at a temperature slightly over 1000°; the gypsum was calcined at 600°. In the mix 5% calcined dolomite and 10 to 15% anhydrite were used. The reactions taking place during the hardening of this cement are described. M.Ho.

Diabase-cement coatings for protection against corrosion. N. A. Butkov and N. I. Dobroshtan. *Vostochnaya Neft*, **1940**, No. 5–6, pp. 47–49; *Khim. Referat. Zhur.*, **4** [3] 88 (1941).—An acid-resistant cement produced by the Bryansk works under the trademark KTsV was mixed with water glass (1 part cement to 0.25 part water glass, specific gravity 1.34). The results were negative. Incorporating into the cement 2 to 5% of material such as rosin, oleic acid, aluminum naphthalate, acidol, or peat pitch lowered the resistance of the cement without being effective. Further experiments were made with diabase-cement coatings. Tests with this material for 100 hr. at 210° to 220° proved it to be resistant to mazut (crude oil) and to be a satisfactory protective coating against corrosion. M.Ho.

Properties of silicate cements. D. E. Sorkina and E. S. Morozova. *Korroziya i Bor'ba s nei*, **6** [4] 23–27 (1940); *Khim. Referat. Zhur.*, **4** [4] 103 (1941).—The authors investigated diabase, beshtaunite, and acid-resistant Bryansk cements, the latter two having the trademarks KTs and KTsV. Water glass with a modulus of 2.63 was used as bonding material. The following properties were investigated: acid resistance, mechanical strength, adherence to iron and ceramic products, degree of penetration, and setting. Cements containing sodium fluosilicate, i.e., diabase and beshtaunite cements, were ready for use after 10 days' drying in air, whereas the cements of the Bryansk works required 20 to 30 days. The diabase cement was the strongest mechanically and the most resistant to aggressive media, had the highest degree of penetration, and bonded best with iron and ceramic products. The Bryansk cements had the lowest setting. The oxidation of the silicate cements increased their resistance to water. The diabase cement is considered the best. M.Ho.

Rapid method for determining moisture in gypsum products. A. S. Vasil'ev and T. Ya. Pomerantseva. *Prom. Stroitel. Materialov*, **1940**, No. 10–11, pp. 41–43; *Khim. Referat. Zhur.*, **4** [4] 77–78 (1941).—The proposed method is based on the removal of the moisture from the tested material with dry ether. M.Ho.

Results of recent investigations of cements. W. Eitel. *Angew. Chem.*, **54** [15–16] 185–92 (1941).—Physicochemical investigation of modern cements must develop and determine the specific demands for cement: highest mechanical strength for buildings, high bending and tensile strengths and resistance to climatic influences for road building, and resistance to corroding influences in reinforced concrete for large dams with little heating in setting. E. discusses and explains the mineralogical constitution of Portland cement clinker, fusion equilibria of the system CaO–Al_2O_3–SiO_2, flux effect of calcium fluoride, crystal structure and hydraulic behavior of the clinker minerals, hydration phenomena in the setting process, and recent methods of investigating adsorption and recrystallization phenomena. The agent for the setting of cement is tricalcium silicate and the more slowly reacting dicalcium silicate in its 3 modifications, α, β, and γ. Tricalcium aluminate must be considered as the principal factor in the setting of cements mixed with water; other factors are $5CaO \cdot 3Al_2O_3$, which, according to most recent investigations, actually has the form $12CaO \cdot 7Al_2O_3$, and tetracalcium aluminate ferrite ($4CaO \cdot Al_2O_3 \cdot Fe_2O_3$), which lessens the violent hydration of $3CaO \cdot Al_2O_3$. Most of the modern developments and improvements in the properties and structure of cements are due to research with X rays and the electron microscope. M.Ha.

Synthesis of minerals of Portland cement clinker. S. D. Okorokov, S. L. Vol'fson, and T. N. Burakova. *Sbornik Trudov Leningrad. Tekh. Inst. VSPK*, **1940**, No. 3, pp. 91–125; *Khim. Referat. Zhur.*, **4** [3] 87 (1941).—Methods for synthesizing $3CaO \cdot SiO_2$, $2CaO \cdot SiO_2$, $3CaO \cdot Al_2O_3$, $5CaO \cdot 3Al_2O_3$, $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$, and $2CaO \cdot Fe_2O_3$ are described. These minerals are not only component parts of Portland cement, but some enter into the composition of other binders, such as alumina cement, Roman cement, and hydraulic lime. The authors discuss the methods of calculating the batch, its calcining, and methods for determining the purity of the products and give the results of their experience with clinker minerals. M.Ho.

Thermal characteristics of high-temperature oil-well cements. E. E. Byrd and F. W. Jessen. *Ind. Eng. Chem.*, **34** [10] 1142–48 (1942).—The total heat of hydration up to the time of the final set for five high-temperature oil-well cements was determined at temperatures of 150°, 175°, and 200°F. The chemical composition, fineness, presence of additives, and temperature all determine the total heat evolution from a cement until the time of its final set. The setting times and quantity of heat liberated by cements containing no additives are largely dependent on the chemical composition and fineness of the grind. Consistency measurements at elevated temperatures provide a means of predicting the rate at which a cement slurry will attain its initial set. The admixture-type cements have lower consistencies and remain pumpable over a longer period of time than do the nonadmixture-type cements. Wide divergence in the heat evolutions of the various cements leads to the conclusion that reactions accompanying the hydration of cement at elevated temperatures result in the formation of compounds quite different from those formed at lower temperatures. Illustrated. F.G.H.

Thermal dissociation of gypsum and the change in its specific gravity on thermal treatment. V. I. Serdyukov. *Zhur. Obshchei Khim.*, **10** [14] 1306–18 (1940); *Khim. Referat. Zhur.*, **4** [4] 97 (1941).—The incorporation of 10% SiO_2 lowers the decomposition and fusing point of gypsum to 1250° to 1300° compared with 1400° to 1500° in the absence of SiO_2. The change in the specific gravity as determined by the temperature of calcination was studied. Between 600° and 1100° the specific gravity increases constantly; this fact is explained by the effect of heat on the density of the gypsum grains. Between 1100° and 1400° the specific gravity increases very slowly. Above 1400°, it increases rapidly, which is explained by the increase of the percentage of free CaO. The curves presenting the change in the specific gravity of calcined gypsum containing SiO_2 within the limits of 1100° and 1300° are steeper than those for gypsum without SiO_2. This phenomenon is explained by the intensification of the decomposition process. If the change in specific gravity as affected by temperature for such a mixture is calculated on the basis of the additivity of specific gravity, a curve is obtained which is lower than the experimental curve. S. points out that this is due to the formation of meta- and ortho-calcium silicates from SiO_2 and CaO. M.Ho.

SEPARATE PUBLICATION

Pigments for Coloring Cement, Magnesium Oxychloride, and Concrete. British Standard Specification No. 1014—1942. British Standards Inst., London. Price 2s net.—This Specification deals with the following pigments: chromium oxide, hydroxides of chromium, red iron oxide, carbon blacks, black iron oxide, yellow oxide and hydroxide of iron (including natural ochers), and brown oxide of iron (including sienna and umber). The requirements

are limited to texture, composition, volatile matter, soluble matter, and color and staining power and are not rigid. In the case of color and staining power, comparison is made with an agreed sample and not with a standard. No test of the permanence of black pigments is included, but users are advised to obtain a suitable assurance from the supplier. No restriction is made as to the proportion of lead and zinc compounds which may affect the setting of the cement, but if more than 0.1% is present users should make a test with cement. The use of more than 10% of any pigment in a cement or concrete is discouraged because of its adverse effect on the strength of the product. A.B.S.

PATENT

Plaster of Paris aerating composition. C. G. F. CAVADINO (Gyproc Products, Ltd.). Can. 406,702, Aug. 11, 1942 (Dec. 20, 1939). G.M.H.

Enamel

Elimination of boiling in sheet ground enamels. K. *Keram. Rundschau*, **45** [26] 286–88 (1937).—Experiments were made to determine whether the phenomenon of boiling, which is caused by the liberation of gases in the enamel, is a primary or a secondary reaction, i.e., whether it can be attributed to the nature of the raw ware and the enamel composition or to the treatment received during the enameling process (pickling and cleaning of the metal surface and especially the firing process). Measures to be taken to minimize this defect are discussed, but as long as the exact relationship of the reaction between the sheet and the ground during smelting remains obscure and the effect of the pretreatment and nature of the sheet surface is not known, it will be difficult to eliminate boiling in all cases. M.V.C.

Improving the formulas for colored enamels on metal. AGRANENKO. *Byull. Obmena Opytom Lakokrasochnoĭ Prom.*, **1940**, No. 7–8, pp. 25–26; *Khim. Referat. Zhur.*, **4** [3] 101 (1941). M.Ho.

Motion pictures of enamel defects. A. I. ANDREWS. *Proc. Porcelain Enamel Inst. Forum, Sixth Forum, Oct., 1941*, pp. 49–51.

Resistance of enamels to thermal shock. E. E. HOWE AND E. P. BOLIN. *Jour. Amer. Ceram. Soc.*, **25** [15] 463–66 (Nov., 1942).—12 references, 3 figures.

Symposium on job training: Organization and methods for vocational training in industry. E. L. HEUSCH. *Proc. Porcelain Enamel Inst. Forum, Sixth Forum, Oct., 1941*, pp. 52–57. **Apprenticeship.** S. J. AURELIUS. *Ibid.*, pp. 57–60. **Remarks on job training.** J. W. PETTIJOHN. *Ibid.*, pp. 60–63. **Science and practice of porcelain enameling.** H. W. ELLISON. *Ibid.*, pp. 63–70.

Symposium on problems in operating an enameling department at peak production and under war conditions. CLIFFORD ANDREWS. *Proc. Porcelain Enamel Inst. Forum, Sixth Forum, Oct., 1941*, pp. 121–23. ALLEN E. APPLE. *Ibid.*, pp. 123–26. PAUL GERDES. *Ibid.*, pp. 126–29. L. E. NORDHOLT. *Ibid.*, pp. 129–32. F. W. ROZENE. *Ibid.*, pp. 132–34. L. K. SOSEY. *Ibid.*, pp. 134–39. See "Operating . . .," *Ceram. Abs.*, **21** [11] 229 (1942).

Symposium on spraying: Recent trends in porcelain enamel spraying. E. F. WATTS. *Proc. Porcelain Enamel Inst. Forum, Sixth Forum, Oct., 1941*, pp. 6–14; *Enamelist*, **19** [2] 19–27 (1941).—Spray guns, spray booths, pressure material tanks, and automatic machines are described. An ideal porcelain enamel finishing room should have the following features: (1) It should be enclosed and under pressure. (2) Supply air should be washed, reheated, and humidified, or oil filters should be used. (3) The air supply should be evenly distributed. (4) Water wash chambers behind the spray booth provide cleanliness and an opportunity for reclaiming ground-coat enamel. Typical completely automatic spray setups are shown. **Motion pictures on spraying.** F. L. MICHAEL. *Proc. Porcelain Enamel Inst. Forum, Sixth Forum, Oct., 1941*, pp. 14–15. **Remarks on spraying.** ROY BECK. *Ibid.*, pp. 15–25. L.E.T.

SEPARATE PUBLICATION

Test for Resistance of Porcelain Enamels to Gouging. Porcelain Enamel Inst., Inc., Chicago, Ill., Product Standards Section, Washington, D. C., July, 1942. 12 pp. Price 25¢.—The resistance of enamels to mechanical wear depends on (1) the resistance of the surface layer to abrasion and (2) the resistance of the underlying enamel structure to crushing. The first type of wear occurs when the enamel surface is continually scrubbed with an abrasive powder, and both types may be involved in the scratching or gouging of an enamel, as the surface is penetrated and the understructure is crushed or torn. A separate test was designed to determine the resistance of enamels to surface abrasion only. The present test was designed to determine their resistance to gouging. The gouge test, made by rolling a small steel ball on the surface of the enamel under known loads, gives more satisfactory results than the scratch test, made by using a phonograph needle under known loads. A series of strokes, each under constant load, with a definite load increment between strokes, gives a more satisfactory end point than that obtained when the load is increased continuously as the stroke progresses. The increasing-load method, however, gives a preliminary indication of the range of loads within which successive strokes at various constant loads should be made.

PATENTS

Coated metallic article for use at elevated temperatures. M. D. LUCAS. U. S. 2,300,454, Nov. 3, 1942 (June 8, 1940).—That method of treating a metallic article to render it resistant to oxidation at elevated temperatures which comprises applying to the article a coating of an unfritted mixture of chrome ore and cast-iron enamel ground coat frit substantially free from cobalt compounds and heating the coated article to vitrify the frit and form a vitrified coating bonded to the underlying metal, the chrome ore being dispersed through the vitrified frit coating which acts as a matrix therefor and the coating thus formed protecting the underlying metal against oxidation and scaling at high temperatures.

Enameled range boiler. H. R. CANFIELD (Porcelain Steels, Inc.). U. S. 2,303,197, Nov. 24, 1942 (Oct. 23, 1939).

Enamel-lined beer barrel. E. G. NYBERG (A. O. Smith Corp.). U. S. 2,301,075, Nov. 3, 1942 (May 17, 1937; March 8, 1940).

Methods and apparatus for enameling rectangular wires. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 548,579, Oct. 28, 1942 (July 17, 1940).

Opaquing agent for enamels and process for manufacturing. MAXIME PÂQUET. U. S. 2,299,764, Oct. 27, 1942 (April 29, 1939).—A process for preparing an opaquing agent for enamels which comprises the steps of intimately mixing cerium oxide with magnesia and calcining the mixture.

Porcelained metal structure and method of making. CLARENCE MASTERS (Koch Butchers' Supply Co.). U. S. 2,302,563, Nov. 17, 1942 (Sept. 25, 1940).

Vitreous coatings. WESTINGHOUSE ELECTRIC INTERNATIONAL CO. Brit. 547,532, Sept. 16, 1942 (April 10, 1940).

Glass

Deterioration of old whiskey bottles. A. SILVERMAN AND L. G. GHERING. *Glass Ind.*, **23** [9] 339 (1942).—Certain bottles in cases of rye whiskey stored since 1918 had crackled, checked, and lost their contents. Analysis disclosed that the crackled bottles were about 4% higher in soda at the expense of lime compared with bottles from the same case that remained intact. A quarter of a century at ordinary room temperatures and humidities seems to have been the limit of their endurance. A.P.

Drawn glass. ANON. *Can. Chem. & Process Industries*, **26** [9] 517–19 (1942).—A mix for window glass consists of high purity silica sand, 40% cullet, soda ash, salt cake, and limestone. To prevent crystallization, European glassmakers add small amounts of alumina and substitute 2% soda for an equal amount of CaO. In North America, some magnesia is used in place of the additional alumina. The Fourcault drawing process consists in drawing the molten glass upward between asbestos-covered rollers. Thickness of the glass is determined by the rate of drawing, hardness as affected by temperature, and immersion depth of the drawing block. See "Modern . . .," *Ceram. Abs.*, **21** [11] 232 (1942). B.L.

Effect of organic-dye ions on the electrokinetic potential at the glass-water interface. D. O. JORDAN. *Trans. Faraday Soc.*, **37** [9] 441 (1941).—J. discusses the ζ potential at the glass-water interface and the effect of the addition of univalent inorganic cations. An experimental streaming potential method of determining the dipole moment (de) of the glass-water interface layer is described. Experiments are also described in which the dipole moment is determined in the presence of five dyes: new fuchsine (C. I. 678), benzopurpurine 4B (C. I. 448), chlorazol sky blue FF (C. I. 518), Congo red (C. I. 370), and orange II (C. I. 151). The formula used, $de = k_s E/P$, was that of Bull and Gortner. Coagulation took place at the glass-water interface in the case of those dyes which are known to exist as colloidal micelles in aqueous solution. F.J.H.

Electroconductivity of glass. R. L. MYULLER. *Uchenye Zapiski Leningrad. Gosudarst. Univ., Ser. Khim. Nauk*, **5** [54] 159–74 (1940); *Khim. Referat. Zhur.*, **4** [4] 20–21 (1941).—M. deals with the electroconductivity of glass as affected by the temperature and composition. He developed a method whereby the conductivity of glass varying between 10^{-5} and 10^{-17} can be determined with an error not exceeding 10 to 15%. The following types of glass were investigated: B_2O_3–Me_2O, B_2O_3–MeO, and the ternary composition B_2O_3–$Me_2'O$–$Me_2'O$. In all instances the effect of the temperature could be expressed by $x = Be^{-(E/2RT)}$, where E is the energy of displacement of the cations carrying the current in electrolysis and corresponds to the energy of removing an ion from a crystalline lattice. The electroconductivity increases with an increased content of alkalis. Starting with a certain critical concentration, a rapid rise of the conductivity curve can be observed. The critical concentration corresponds to the cations approaching a distance equaling the diameter of a molecule of boric anhydride. The increase in electroconductivity is explicable by the electrostatic interaction of saltlike molecules. This is corroborated by the accompanying decrease in the energy of ionic displacement, E (from 100 to 40 cal.). A study of the electric conductivity of 3-component systems showed that it is an additive property caused by the presence of two alkali oxides. Apparently, the structural properties peculiar to each of the 2-component systems is also preserved in the 3-component systems. Glasses containing 3 components should therefore be regarded as microheterogeneous systems. Their optical uniformity is evidence of the high degree of dispersion of the alkali saltlike inclusions within the anhydrous net of the glass. The determination of the conductivity of glass, besides the theoretical interest, also has practical significance, especially for selecting proper glass for glass electrodes, cathode lamps, insulating enamels, etc. See "Structure . . .," *Ceram. Abs.*, **20** [11] 262 (1941). M.Ho.

Electroconductivity of a ternary glasslike system of the composition Na_2O–K_2O–B_2O_3. N. I. BRODSKAYA AND V. S. TATARINOVA. *Uchenye Zapiski Leningrad. Gosudarst. Univ., Ser. Khim. Nauk*, **5** [54] 241–57 (1940); *Khim. Referat. Zhur.*, **4** [4] 21 (1941).—The effect of temperature and composition on the electroconductivity of glass containing Na_2O, K_2O, and B_2O_3 was investigated. Temperatures between 100° and 300° were used. The measurements were made by a modified Bronson method. The effect of temperature on all of the glasses can be satisfactorily expressed by $\log x = (A/T) + B$. The slope of the lines, characterized by the value of A, which is the energy required to remove an ion from the quasi-crystalline lattice of glass, depends on the composition. The electroconductivity of glass depends not only on the general content of alkalis but also on the ratio of the two alkali oxides. The conductivity curve passes a minimum corresponding to $Na_2O:K_2O$ = approximately 1. As a first approximation, the conductivity of the ternary system is the sum of that of the two binary systems Na_2O–B_2O_3 and K_2O–B_2O_3. The deviations from this additivity, however, were at times considerable, as in the case of Li_2O–K_2O–B_2O_3 in which the added conductivity is appreciably greater than the conductivity of the ternary system. Apparently, this is connected with the proximity of the radii of K^+ and Na^+ and the ability of the borates of these metals to form mixed crystals. Because of this, the independent behavior of the cations is less pronounced than in the case of Li-K glass. Generally, the electroconductivity of glass of similar composition is determined primarily by the concentration of the alkali component present in the largest amount. M.Ho.

Fluorescence of manganese in glasses and crystals. S. H. LINWOOD AND W. A. WEYL. *Jour. Optical Soc. Amer.*, **32**, 443–53 (1942).—Ions of the transition elements have been used as optical indicators for studying the atomic structure of glass and its rearrangement with heat-treatment. Divalent manganese is insensitive as a color indicator but sensitive in its characteristic fluorescence. In glasses or crystals, manganese fluoresces bright green, red, or intermediate colors. Previously ascribed to Mn^{++} and Mn^{+++}, the emission color changes are here correlated with shifts in oxygen coordination of the Mn^{++} from four (green) to six (red), comparable to absorption color changes of cobalt and nickel. Confirmation of this explanation was derived by comparing the fluorescence of manganese in a variety of base glasses with the blue (fourfold) to pink (sixfold) transition of cobalt and also from the relative effects of temperature on the green or red fluorescence. The green was more susceptible to quenching on increasing the concentration, the fluorescence disappearing when every tenth Si^{4+} was replaced by Mn^{++}. In the orange- and red-fluorescing glasses, MnO could be introduced in amounts up to 15% (the limiting composition because of devitrification) and still show a distinct orange. By analogy, the fluorescence colors of crystalline phosphors are explained from crystal chemical considerations as to whether the Mn^{++} is part of the lattice or in interstitial positions. Yellow fluorescence obtained with some manganese-activated zinc silicates is attributed to a cristobalite structure. In willemite, the manganese is surrounded by four oxygens to give green. Imperfections in the crystal lattice have important effects on the fluorescence. A.P.

Foam glass: III. E. L. KREIDL. *Glass Ind.*, **23** [9] 340–43, 351, 354 (1942).—Processes for the manufacture of foam glass are discussed with regard to existing patent literature. Fifty patents are listed and described. For Part II see *Ceram. Abs.*, **21** [10] 210 (1942). A.P.

Glass reflection increased. ANON. *Bull. Amer. Ceram. Soc.*, **21** [12] 313 (1942); see "Glass without glare . . .," *Ceram. Abs.*, **21** [1] 8 (1942).

Glass springs. ANON. *Science News Letter*, **42** [12] 192 (1942).—Glass springs, although not so strong as steel springs, show a greater absence of fatigue and greater re-

sistance to chemical action. See "Weighing . . . ," *Ceram. Abs.*, **19** [3] 72 (1940). G.A.K.

Glass yarn for bombers' electric wiring. ANON. *Science News Letter*, **42** [14] 217 (1942). G.A.K.

Increasing efficiency in wartime purchasing. ERNEST W. FAIR. *Glass Ind.*, **23** [10] 389 (1942).—F. gives the following wartime purchasing rules for glass plants: (1) Nothing should be purchased unless it can do its specific job more efficiently and more economically. (2) Supplies and materials must be purchased on the basis of the trade name and reputation of the manufacturer. (3) Specifications should accurately but simply describe the item and its physical or performance requirements. (4) Orders should be placed early for immediate delivery. (5) Strict stock records should be kept. A.P.

Influence of temperature on the mechanical strength of glass. G. O. JONES AND W. E. S. TURNER. *Jour. Soc. Glass Tech.*, **26** [113] 35-61T (1942).—Measurements of the bending strength of glass laths were made on more than 2000 specimens of drawn sheet glass approximately 0.25 to 0.29 cm. thick at temperatures ranging from 20° to about 20° below the softening point (M_g). The test pieces (0.5 cm. wide and 5 cm. long, with ground and polished sides and fire-finished edges) were loaded at the uniform rate of 150 gm. per sec. to cause fracture in about 1 min. Under these conditions, the strength remained unaffected by temperature until about 30° to 40° below the transformation point, 534°. Above this point the strength began to decrease, being reduced by about one-third at the highest temperature at which experiments were practicable (about 20° below M_g). At higher temperatures, the viscous deflection of the glass strip prevented satisfactory measurements. The fractured surfaces exhibited the same characteristics at 580° as at 20°. Other specimens were loaded with fractions of the mean breaking load, and at the higher temperatures these test pieces sustained the load for longer periods before breaking. In each series of experiments, at least 100 specimens were tested at each temperature considered. The erroneous conclusion to which investigators may be led when depending on smaller numbers of tests was demonstrated by the variation occurring in the mean strength values when based on fewer samples. The wisdom of basing the tests on fire-finished specimens was also indicated. The experimental results differ fundamentally from those for metals. R.H.B.

Interpretation of thermal-endurance tests on glass containers. J. B. MURGATROYD. *Jour. Soc. Glass Tech.*, **26** [113] 22-34T (1942).—The examination of glass specimens fractured in thermal-endurance tests reveals the possible cause of the failure. The examination is based on the knowledge of (1) the location, direction, and intensity of the stresses in the container under the test conditions; (2) the character of the fracture surfaces to determine the point of origin of the fracture; (3) the various types of surface flow; and (4) the state of homogeneity and annealing of the glass. The analysis of the thermal-endurance test specimens is outlined. R.H.B.

Manufacture of scientific apparatus and glassware: I. ANON. *Ind. Chemist*, **17** [202] 270–73 (1941).—The factory of J. W. Towers & Co., Ltd., England, is described. Both soft soda and Pyrex brand glass equipment are produced. The manufacture of interchangeable ground glass joints and the graduation of volumetric equipment are described. Almost all of the operations are carried out by women. 6 illustrations. **II.** *Ibid.*, [203] 294–98.—Hydrometers and glass pipe lines are produced. 7 illustrations. See "Glass piping . . . ," *Ceram. Abs.*, **21** [3] 59 (1942). E.D.M.

New packages save tin. ANON. *Science News Letter*, **42** [12] 179 (1942).—Glass containers for foods and other commodities are cited as a wartime solution of the scarcity of tin and steel. From the quantity of tin-coated steel required to make only 265 quart cans, 14,400 closures for quart glass containers can be made. Glass cannot compete with tin in packaging goods for Army and Navy use because it is too breakable for rough handling at sea or in the field. See "Glass replaces . . . ," *Ceram. Abs.*, **21** [1] 8 (1942); "Simplification . . . ," *ibid.*, [5] 101. G.A.K.

New polarizing glasses used for different colors. ANON. *Science News Letter*, **42** [17] 268 (1942).—Rotatable lenses are superimposed on regular polarizing glasses. The new lenses contain two polarizing films, with their polarizing axes crossed at right angles. Each is impregnated with a dye and polarizes only a particular color instead of white light as is the case with regular glasses. G.A.K.

Package gives protection. ANON. *Science News Letter*, **42** [12] 182 (1942).—Glass jars and tin cans give the best protection for food against contamination by poison gas. G.A.K.

Pyrex brand glass wool as a filtering medium. G. B. HEISIG. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 766 (1942).—The use of the glass wool as an inert filtering medium is open to question. For all except the most exacting uses, glass wool is satisfactory after it has been thoroughly extracted with a hot acid and washed. F.G.H.

Rate of flow in tank furnaces. K. MATTHES. *Keram. Rundschau*, **45** [23] 252–56; [24] 265–66; [25] 275–77 (1937).—The flow of glass in the tank is caused by differences in the temperature of the mass; hot glass has a lighter specific gravity, while cooler glass is heavier. Glass flows from places where the temperature is high to the cooler places, and the flow may be lengthwise, crosswise, on the surface, or along the bottom. Proof of the under or bottom flow is presented, and the rates of the different flows and their importance are discussed. Thermal flows appear to be a necessary evil, and many defects in glass can be traced to these thermal equalizing motions. Practice tests showed that flows should be so controlled that they proceed from the point of highest temperature on the surface back to the melting batch, which assures that no glass which has not passed through the hot firing zone will flow through the tank. The high temperature or "source point" of the glass should be situated only so far from the batch pile that the glass melting from the pile counteracts the back flow conditioned by the source point of highest temperature. This is the only means of controlling surface currents and keeping the glass melting from the pile for the longest time possible at smelting heat. The works of Gehlhoff, Jebsen-Marwedel, Hausner, and others are referred to. M.V.C.

Removing iron from Aspheron sands used for the production of window glass. I. L. BAGBANLY. *Trudy Khim. Inst. Azerbaĭdzhan. Filial Akad. Nauk S.S.S.R.*, **3**, 25–36 (1940); *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.HO.

Shaping of Plexiglass for windows in aircraft. K. UHLEMANN. *Z. Ver. Deut. Ing.*, **85** [10] 241–42 (1941).—Because of its low density (1.18), transparency, and great impact strength, Plexiglass is particularly suited for windows in airplanes. When broken, it disintegrates into several large pieces with dull edges. It is thermoplastic and can easily be deformed by heating to 100° to 160°C. Devices for shaping it and methods of testing for optical errors are described. M.HA.

Spectral transmission of colored container glass: I and II. D. E. SHARP. *Glass Ind.*, **23** [9] 331–33, 358–59; [10] 380–83 (1942).—Nomenclature for describing light transmission is listed and explained. Three methods of computing transmission for different thicknesses are discussed and illustrated: (1) by direct calculation, (2) from a special table which is reproduced, and (3) graphically. Tabular data and spectral transmission curves are given for 34 commercial glasses. A wide range in light absorption can be obtained by using glasses that are now made commercially in quantity and by the designing of containers to obtain suitable thicknesses. A.P.

Spinning and weaving of glass. D. KARASEV. *Amerik. Tekhnika*, **1940**, No. 7, pp. 360–61; *Khim. Referat. Zhur.*, **4** [3] 85 (1941).—K. describes the methods used in the U. S. for spinning and weaving glass and points out their possible uses. M.HO.

Strength of bottles as affected by limitations of manufacturing processes. F. W. PRESTON. *Jour. Amer. Ceram. Soc.*, **25** [15] 427–34 (Nov., 1942).—2 references, 11 figures.

Studies correlating bottling line with pressure-test breakage. A. HERMAN AND H. M. KINDSVATER. *Jour. Amer. Ceram. Soc.*, **25** [15] 434–38 (Nov., 1942).—4 references, 5 figures.

Use of sulfate in the glass batch. P. *Keram. Rundschau*, **45** [20–21] 226–28 (1937).—If smelting temperatures are sufficiently high, the heat is properly distributed, and a reducing atmosphere is maintained in the cooler parts of the furnace, the injurious indirect action of sulfate on the durability of the block in tank and pot furnaces is reduced to such an extent that it is completely outweighed by the advantages of the use of sulfate. These include the acceleration of the smelting time up to 20%, cheapness as compared with the use of soda, favorable effect on the refining process, etc. M.V.C.

BOOK

Chemistry of Glassmaking. P. N. GRIGOR'EV. Gizlegprom, Moscow and Leningrad, 1940. 3d revised ed. 156 pp. Price 5.50 R. Reviewed in *Khim. Referat. Zhur.*, **4** [3] 84 (1941). M.Ho.

PATENTS

Apparatus for making contact lenses. A. F. DITTMER. (Bausch & Lomb Optical Co.). U. S. 2,300,210, Oct. 27, 1942 (Dec. 31, 1938).

Apparatus for manufacturing hollow glass articles. R. H. BARNARD, F. T. NESBITT, C. W. SCHREIBER, J. P. BENOIT, AND J. E. MCLAUGHLIN (Owens-Illinois Glass Co.). U. S. 2,300,862, Nov. 3, 1942 (Dec. 19, 1938).

Apparatus for molding glass. G. P. GOWLLAND. Brit. 548,596, Oct. 28, 1942 (July 11, 1941).

Apparatus for tempering glass. BERNARD LONG (American Securit Co.). U. S. 2,298,709, Oct. 13, 1942 (March 17, 1939); divided out of U. S. 2,244,715 (*Ceram. Abs.*, **20** [8] 194 (1941)).

Article made of sponge glass and method of manufacturing. BERNARD LONG (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). U. S. 2,301,062, Nov. 3, 1942 (April 4, 1939).

Asbestos and glass fiber yarn production. D. C. SIMPSON (Fiberglas Canada, Ltd.). Can. 405,918, July 7, 1942 (Nov. 9, 1940; in U. S. May 22, 1937). G.M.H.

Blowing air control for glassware-forming machines. C. C. NUZUM (Owens-Illinois Glass Co.). U. S. 2,301,139, Nov. 3, 1942 (Nov. 4, 1940).

Bottle-blowing apparatus. L. D. SOUBIER AND A. E. SCHEUERMAN (Owens-Illinois Glass Co.). U. S. 2,298,728, Oct. 13, 1942 (Jan. 10, 1939).

Carbon-bonded fiber glass. J. F. HYDE (Fiberglas Canada, Ltd.). Can. 407,285, Sept. 8, 1942 (June 25, 1938; in U. S. Aug. 25, 1937). G.M.H.

Cast glass article. A. W. HULL AND R. W. MOORE (General Electric Co.). U. S. 2,299,750, Oct. 27, 1942 (Nov. 22, 1939).—An electric bushing comprising a generally cylindrical glass body.

Coated glass fabric. C. S. HYATT AND J. C. LOWMAN (Columbus Coated Fabrics Corp.). U. S. 2,298,295, Oct. 13, 1942 (April 8, 1938).—As a new article of manufacture, a highly flexible woven glass fabric fibrous sheet coated and impregnated with a plastic composition composed of the heat-reaction product of 100 parts oil-soluble phenol formaldehyde resin, 312 parts Chinawood oil, and 160 parts bodied linseed oil and 300 parts titanium dioxide.

Composition for use in mortar bonding glass, etc. R. R. MCGREGOR AND E. L. WARRICK (Corning Glass Works). U. S. 2,299,552, Oct. 20, 1942 (April 18, 1939; Aug. 4, 1939).

Cooling nozzle for bottles and other glass containers. H. A. WADMAN (Hartford-Empire Co.). U. S. 2,302,078, Nov. 17, 1942 (Nov. 25, 1939).

Cutting glass. J. H. BOICEY AND R. F. LECK (Libbey-Owens-Ford Glass Co.). U. S. 2,302,174, Nov. 17, 1942 (June 27, 1940).

Double-walled glass unit. MILTON KNIGHT (Libbey-Owens-Ford Glass Co.). U. S. 2,303,125, Nov. 24, 1942 (June 26, 1940).

Edging machine. C. B. SCHAFER AND EDWARD OBERSTAR (Libbey-Owens-Ford Glass Co.). U. S. 2,299,850, Oct. 27, 1942 (Dec. 15, 1939).

Electric furnace for melting glass. E. V. BOREL. (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). Can. 406,434, July 28, 1942 (July 25, 1941). G.M.H.

Electric glass furnace. E. V. BOREL (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). Can. 407,469, Sept. 15, 1942 (Aug. 26, 1941). G.M.H.

Feeding molten glass. G. T. MEYERS (Meyers Co.). U. S. 2,301,134, Nov. 3, 1942 (Sept. 6, 1939).

Fibrous silicate and articles. J. F. HYDE (Fiberglas Canada, Ltd.). Can. 406,698, Aug. 11, 1942 (June 25, 1938; in U. S. July 16, 1937). G.M.H.

Fluorescent article. B. S. ELLEFSON (Sylvania Electric Products, Inc.). U. S. 2,301,690, Nov. 10, 1942 (Feb. 3, 1938; April 12, 1941).—A fluorescent screen material of a devitrified glass formed from a melted mixture of BeO, ZnO, and SiO_2, wherein the BeO and ZnO constitute the greater part by molecular weight of the mixture but less than two-thirds thereof, and containing an activator of the manganese type in a quantity approximately 0.5% by weight, whereby a selectively absorbing glass is produced.

Formation of reflecting surfaces on glass. SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., J. N. ALDINGTON, AND A. J. MEADOWCROFT. Brit. 548,353, Oct. 21, 1942 (April 1, 1941).

Glass chalkboard. A. MCK. GREAVES-WALKER (Libbey-Owens-Ford Glass Co.). U. S. 2,303,120, Nov. 24, 1942 (June 25, 1940).

Glass composition and product. H. R. MOULTON (American Optical Co.). U. S. 2,298,746, Oct. 13, 1942 (Aug. 4, 1941).—A vitreous composition whose analysis is expressed as cadmium oxide 50 to 80%, boric anhydride 20 to 50%, and a stabilizer introducing 0.5 to 2.5% beryllium, based on the batch.

Glassforming roll. J. H. SHERTS (Pittsburgh Plate Glass Co.). U. S. 2,300,528, Nov. 3, 1942 (Feb. 8, 1940).

Glass machine. J. A. LEWIS (Sneath Glass Co.). U. S. 2,301,892, Nov. 10, 1942 (Nov. 5, 1938; May 31, 1939).—An article remover control mechanism.

Glassmelting furnace. L. S. LONGENECKER. U. S. 2,300,426 and 2,300,427, Nov. 3, 1942 (June 29, 1940).

Glass-to-metal seal. G. R. SHAW (Radio Corporation of America). U. S. 2,298,974, Oct. 13, 1942 (Nov. 30, 1939).

Glass-polishing apparatus. F. B. WALDRON (Pilkington Bros., Ltd.). Can. 406,567, Aug. 4, 1942 (Dec. 11, 1940). G.M.H.

Glass tanks and receptacles for molten glass. AUSTRALIAN GLASS MANUFACTURERS CO. PROPRIETARY, LTD. Brit. 548,575, Oct. 28, 1942 (June 28, 1940).

Laminated glass and mounting therefor. B. J. DENNISON AND F. F. PAINTER (Pittsburgh Plate Glass Co.). U. S. 2,298,874, Oct. 13, 1942 (Dec. 28, 1940).

Lamp exhausting and sealing apparatus. W. J. GEIGER AND R. J. AYRES (Canadian General Electric Co., Ltd.). Can. 406,188, July 21, 1942 (Sept. 26, 1939). W. J. GEIGER AND WILSON DAVIDSON (Canadian General Electric Co., Ltd.). Can. 405,902, July 7, 1942 (Sept. 26, 1939). G.M.H.

Lamp-sealing apparatus. R. F. STRICKLAND (Canadian General Electric Co., Ltd.). Can. 405,904, July 7, 1942 (Nov. 15, 1939). G.M.H.

Lenses. KODAK, LTD. (Eastman Kodak Co.). Brit. 547,691, Sept. 16, 1942 (May 21, 1941).

Lens-grinding machine. R. F. METZGER. U. S. 2,298,496, Oct. 13, 1942 (Aug. 9, 1941).

Machines for grinding and polishing prisms. HOUGHTON-BUTCHER MFG. CO., LTD., AND H. KERR-THOMAS. Brit. 547,511, Sept. 9, 1942 (June 13, 1941).

Making filamentous glass. GAMES SLAYTER AND J. H. THOMAS (Owens-Corning Fiberglas Corp.). U. S. 2,300,736, Nov. 3, 1942 (May 20, 1938).

Manufacture of glass hollow ware. AUSTRALIAN GLASS MANUFACTURERS CO. PROPRIETARY, LTD. Brit. 547,474, Sept. 9, 1942 (June 24, 1940).

Manufacture of glass tubes. S. J. EVERETT. Brit. 547,880, Sept. 30, 1942 (Feb. 8, 1941).

Manufacture of laboratory glassware. J. A. JOBLING & CO., LTD., AND E. J. C. BOWMAKER. Brit. 547,994, Sept. 30, 1942 (Sept. 4, 1941).

Means for molding glass articles. S. H. PELTIER (Peltier Glass Co.). U. S. 2,302,886, Nov. 24, 1942 (Sept. 18, 1940).

Method and apparatus for forming glass hollow ware. A. F. MCNISH AND J. MONCRIEFF, LTD. Brit. 547,611, Sept. 16, 1942 (May 19, 1941).

Method and apparatus for manufacture of thin-walled glass hollow ware. A. F. MCNISH AND J. MONCRIEFF, LTD. Brit. 547,612, Sept. 16, 1942 (May 19, 1941).

Method and apparatus for producing glass yarn. PIERO MODIGLIANI (Owens-Corning Fiberglas Corp.). U. S. 2,302,790, Nov. 24, 1942 (Oct. 24, 1938).

Methods and apparatus for tempering glass articles. PILKINGTON BROS., LTD. Brit. 547,545, Sept. 16, 1942 (Aug. 3, 1940).

Mineral wool. R. C. JOHNSON (Anthracite Industries, Inc.). U. S. 2,300,930, Nov. 3, 1942 (Aug. 8, 1938).

Mineral wool. C. F. RAMSEYER AND C. R. BUSS. Can. 407,462, Sept. 15, 1942 (Jan. 7, 1937). G.M.H.

Minimizing breakage of glass during the production of a ground or polished continuous strip of glass. PILKINGTON BROS., LTD., F. B. WALDRON, AND J. H. GRIFFIN. Brit. 548,319, Oct. 21, 1942 (April 24, 1941).

Molding blanks of predetermined mass. C. V. SMITH (Univis Lens Co.). U. S. 2,302,918, Nov. 24, 1942 (Sept. 12, 1940).

Molding nonplastic materials. F. A. BICKFORD (Corning Glass Works). U. S. 2,299,374, Oct. 20, 1942 (April 9, 1941).—The method of slip casting nonplastic ceramic materials which includes wet milling the material until at least 95% of it will pass through a screen having 325 meshes per in., drying the resultant slip to a coherent chalky mass, repowdering the mass to a uniform texture free from lumps, forming a slip of the dried and repowdered material with water, introducing the slip into a mold, and extracting the water from the slip.

Mounting glass pulls. M. C. KOESTER (Libbey-Owens-Ford Glass Co.). U. S. 2,299,827, Oct. 27, 1942 (Aug. 9, 1939).

Multiple glazing unit. J. H. BOICEY (Libbey-Owens-Ford Glass Co.). U. S. 2,302,740, Nov. 24, 1942 (Jan. 27, 1942).

Producing laminated glass structures. G. B. WATKINS AND J. H. BOICEY (Libbey-Owens-Ford Glass Co.). U. S. 2,303,151, Nov. 24, 1942 (Oct. 9, 1941).

Sealing and insulating glass furnaces. E. T. FERNGREN. U. S. 2,299,084, Oct. 20, 1942 (Nov. 27, 1937).

Sheet-glass drawing machine. J. H. REDSHAW (Pittsburgh Plate Glass Co.). U. S. 2,300,522, Nov. 3, 1942 (Jan. 16, 1940).

Sponge glass article manufacture. BERNARD LONG (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). Can. 405,999, July 7, 1942 (June 10, 1941). G.M.H.

Testing glassware. P. L. ORR AND W. W. SHAVER (Corning Glass Works). U. S. 2,301,316, Nov. 10, 1942 (Feb. 28, 1940).—The method of selecting satisfactory ware from a group of containers fabricated from glass which includes simultaneously subjecting opposite surfaces of a wall of each container exclusively to fluids of widely differing temperatures for a predetermined time period and segregating the articles which remain intact from those which are impaired by such treatment.

Wall-tile clip. E. P. LOCKART (Owens-Illinois Glass Co.). U. S. 2,298,740, Oct. 13, 1942 (Dec. 18, 1940).

Structural Clay Products

Accelerated testing of building materials for frost resistance. E. GABER. *Bauverwaltung*, **61** [36] 599–602 (1941); *Z. Ver. Deut. Ing.*, **85** [49–50] 955–56 (1941); *Bldg. Science Abs.*, **15** [3] 40 (1942).—A laboratory frost-resistance testing apparatus for stone and clayware has been developed in which the specimens are subjected in freezing and thawing cycles to rapid temperature changes. The refrigeration apparatus is described and illustrated. It includes, as an essential part, a closed air tunnel in which temperatures as low as −40°C. and air velocity up to 10 m. per sec. can be reached. The times required for the internal temperature to fall to 0°C. or lower were determined for various types of natural stone, brick, etc., using 8.5-cm. cubes of stone, and masonry specimens measuring 25 x 25 x 43 cm. with mortar joints 1.5 cm. thick. For all types of stone tested, the temperature falls more or less rapidly to 0°C., remains for a time at 0°C. until all the water present is frozen, and then continues to fall more or less rapidly; if the specimen is dry, the temperature falls uninterruptedly. The times required to reach the test freezing and thawing temperatures of −15°C. and 15°C., measured by thermocouples, are tabulated. In the freezing test, consisting of 30 cycles of freezing and thawing, the specimens, after a period of partial or total immersion in water at 15°C., are exposed to air at a temperature of −30°C. and a velocity of 5 m. per sec. in the air tunnel until the internal temperature has fallen to −15°C.; they are then transferred for thawing to a drying cupboard in which the air is at 50°C. and moves at a velocity of 5 m. per sec. or to a water tank heated to 50°C. until an internal temperature of 15°C. is reached. The time required for the test is 12 to 24 hr. for stone, 12 hr. for roofing tile, and 48 hr. for brick.

SEPARATE PUBLICATION

Sand-Lime Brick. British Standard Specification No. 187—1942. British Standards Inst., London, 1942. Price 2s.—The brick shall be made of sand or silica rock and lime combined by the action of steam under pressure. The brick shall be $8^3/_4 \pm {}^1/_8$ in. long, $4^3/_{16} \pm {}^1/_{16}$ in. wide, and either $2^5/_8 \pm {}^1/_{16}$ in. or $2^7/_8 \pm {}^1/_{16}$ in. deep. Four classes of brick are recognized: (1) brick for special purposes, i.e., of exceptional strength or for use where they are exposed to freezing when saturated with water; (2) building brick Class A (I), for general facing work; (3) building brick Class A (II), for external facing work with mortars other than strong cement mortars; and (4) building brick Class B, for internal work with mortars other than strong cement mortars. The properties specified are as follows:

	Crushing strength (lb./in.²)	Modulus of rupture (lb./in.²)	Drying shrinkage (% of wet length)
Brick for special purposes	3000	500	0.025
Building brick Class A	2000	350	0.025
Building brick Class B	1000	200	0.035

The crushing strength is determined on 12 wet brick laid flat. The modulus of rupture is also determined on 12 wet brick laid flat with the frog uppermost; an allowance is made for the depth and shape of the frog. The drying shrinkage is determined by measuring the brick after soaking in water and again after drying to constant length (0.0003 in.) at 50°C. and cooling for 4 hr. in a desiccator containing calcium chloride. The humidity in the drying oven is controlled at 17% by means of a saturated solution of calcium chloride, a fan being used to keep the air in circulation. To ensure uniformity of strength, the average strength of the 7 weakest brick shall not be less than 90% of the average of the 12 brick in the case of brick for special purposes or 80% for Class A brick. An appendix (which is not part of the Specification) suggests that

while mortars of all kinds may be used with sand-lime brick, strong cement mortars should not be used with brick of high shrinkage. The following mortars are recommended (parts by volume):

	Cement	Lime	Sand
Cement mortar	1		2–4
Cement-lime mortar	1	1	6
" " "	1	2	6–9
" " "	1	3	8–12
Nonhydraulic or semihydraulic mortar	1		2–4
Eminently hydraulic mortar (with hydraulic lime)	1		2–3

A.B.S.

PATENT

Hollow building block. J. W. AKAM (National Fireproofing Corp.). U. S. 2,301,672, Nov. 10, 1942 (Feb. 15, 1940).

Refractories

Acid open-hearth refractories. J. H. CHESTERS. *Iron Age*, **149** [22] 46–51; [23] 64–70 (1942).—Medium alumina fire-clay brick are used next to the hearth pan and in the doors, and in some furnaces chrome or chrome-magnesite brick are used in the ports. With these exceptions the entire top of the furnace is constructed of first-grade silica brick. The use of optical pyrometers offers the best chance of improving the life of a silica roof, but with an acid furnace, where the life of the back wall may be only three weeks, the pyrometer must be constantly moved. Hard-fired silica brick are superior to chrome-magnesite for back walls. For the front wall, the quality of the jointing cements is highly important; compositions are given. Compositions of sands for bottoming are also given; all contain over 98% silica and (with one exception) less than 0.5% alumina. While in basic checkers silica or high-alumina brick in top courses corrode, in acid checkers the cause of failure is choking. Doors are injured chiefly by iron oxide. E.H.McC.

Anzhero-Sudzhensk quartzite. T. V. MEMNONOVA. *Sbornik Nauch.-Tekh. Stateĭ KMZ*, **1940,** No. 2, pp. 133–36; *Khim. Referat. Zhur.*, **4** [4] 103 (1941).—M. conducted physicochemical and mineralogical analyses of the quartzite. He also tested the fired material. The quartzite is suitable for use in making Dinas. M.Ho.

Apparatus for measuring thermal conductivity of refractories. C. L. NORTON, JR. *Jour. Amer. Ceram. Soc.*, **25** [15] 451–59 (Nov., 1942).—4 references, 19 figures.

Cast linings for induction annealing furnaces. S. BESEDIN. *Novosti Tekhniki*, **1940,** No. 17–18, pp. 32–34; *Khim. Referat. Zhur.*, **4** [3] 87 (1941).—B. successfully used cast concrete linings containing Na silicate with a modulus of 1.7 to 2.5 and a density of 1.15 to 1.25. Ground grog was used as filler. To hasten the setting and hardening, a Martin- or blast-furnace slag or building cement was added to the filler. M.Ho.

Casting-pit refractories. J. H. CHESTERS. *Iron Age*, **148** [21] 43–49; [22] 53–58 (1941).—For ladles, two types of fire-clay brick are used: (1) siliceous fire-clay brick of relatively low melting point and (2) medium- or high-alumina brick with a refractoriness of 3002°F. or over. Use of the second type is increasing. Future developments indicate the use of denser fire-clay brick of high-alumina content (over 3110°F.), plumbago brick (30% flake graphite), and monolithic linings from basic or stabilized dolomite clinker with a suitable bond. The nozzle usually has the same properties as the stopper, and the addition of alumina and feldspar to high-grade fire clay shows marked possibilities. Ladle sleeves or rod covers used in the U. S. are often lacking in refractory properties. Many British types have a melting point of 3020°F. Casting-pit refractories are sometimes blamed for introducing nonmetallic inclusions into steel. Although material therefrom enters the steel, it has not been proved that it remains there. Tables of properties of refractories are included. E.H.McC.

Continuous furnace for producing artificial graphite. V. VESELOVSKIĬ. *Novosti Tekhniki*, **1940,** No. 16, pp. 19–20; *Khim. Referat. Zhur.*, **4** [3] 114 (1941).—V. describes a continuous furnace for producing high-grade graphite constructed by himself and N. V. Pertsov. The entire process is mechanized. M.Ho.

Control testing for consistency of refractory mortars. EARL C. PETRIE AND D. W. KOCHER. *Jour. Amer. Ceram. Soc.*, **25** [15] 459–63 (Nov., 1942).—3 figures.

Dinas with a barite or aluminosilicate binder. T. V. MEMNONOVA. *Sbornik Nauch.-Tekh. Stateĭ KMZ*, **1939,** No. 2, pp. 134–36; *Khim. Referat. Zhur.*, **4** [3] 88 (1941).—M. discusses the effect of BaO and aluminosilicate binders on the properties of Dinas made from Anzhero-Sudzhensk quartzite. The Dinas with the barite binder has a higher mechanical strength, more heat resistance, higher porosity, and higher tridimitization. The Dinas with the aluminosilicate binder is highly refractory, mechanically strong, and porous. The disadvantage of this Dinas is its lowered thermal resistance. M.Ho.

Electric steel plant refractories. J. H. CHESTERS. *Iron Age*, **149** [10] 37–43, 104–105; [11] 53–59 (1942).—The typical arrangement of refractories is as follows: (1) The roof is of silica brick. No specifications have been issued, but properties are, in general, those of roofs for open-hearth furnaces. For small furnaces, better results are sometimes obtained with high-alumina fire-clay or sillimanite brick, the latter having many advantages except cost. (2) For the side walls of a basic arc furnace, the standard is magnesite brick, fired, unfired, or Metalkase. Recent developments include chrome-magnesite and semistable dolomite brick. (3) Magnesite brick is preferable for the tapping arch and silica brick for the charging arch. (4) The hearth is composed of monolithic rammed dolomite or magnesite, and the subhearth of dolomite or magnesite brick. Problems of induction-type furnaces are discussed. Illustrated. E.H.McC.

Experimental batch of refractories made from Ak-tash alumina deposits and their service to the user. A. S. BAZILEVICH. *Ogneupory*, **8** [7] 359–66 (1940); *Khim. Referat. Zhur.*, **4** [3] 86 (1941); see "Refractory. . .," *Ceram. Abs.*, **19** [11] 266 (1940). M.Ho.

Improved processes for manufacturing refractory lining materials. GR. *Keram. Rundschau*, **45** [44] 505–506 (1937).—Practical experiments showed that high-quality refractory lining material (for the chemical industry) in the form of flat plates or circular or oval shells not over 50 cm. in length or breadth can be made satisfactorily by using a press for wire cutting and having a die so constructed that the plates are held together during drying and firing. The material which holds the plates together falls away when the plates are separated and can be used again as grog. Two cross sections of dies for the press are shown. M.V.C.

Kyanite as a possible source for the production of alumina. A. I. LAĬNER. *Yubileĭnyĭ Sbornik Nauchnykh Trudov Moskov. Inst. Tsvetnykh Metalov & Zol.*, **1940,** No. 9, pp. 431–48; *Khim. Referat. Zhur.*, **4** [4] 96 (1941).—The extraction of Al_2O_3 from the aluminosilicate kyanite by direct leaching is practically impossible, even after previous calcination. L. conducted laboratory experiments on the decomposition of kyanite by incorporating it in the charge used for thermally driving off P from apatite. The replacement of SiO_2 by kyanite, which contains Al_2O_3 besides the SiO_2, increases the production of P from apatite. Simultaneously, the kyanite ($Al_2O_3 \cdot SiO_2$) is converted into anorthite ($CaO \cdot Al_2O_3 \cdot 2SiO_2$), which is readily soluble in acids. According to this method, a 50-mesh charge consisting of apatite, coal, and kyanite is melted in an electric furnace, the vapors of P are removed by condensation, and the slag is separated from the molten metals consisting of reduced Fe, etc. The slag is granulated, ground to 50-mesh, and subjected to magnetic separation, thus removing traces of Fe. The purified slag

is treated with hot H_2SO_4 (1.83 H_2SO_4 diluted with an equal volume of H_2O), the resulting pulp is centrifuged, and the filtrate is concentrated and crystallized. The crystals of $Al_2(SO_4)_3 \cdot 18H_2O$ are washed with concentrated H_2SO_4 to remove gypsum and calcined. The resulting Al_2O_3 is washed with HCl and dried. For each ton of P, over 5 tons of Al_2O_3 are produced. The process of the production of P proceeds normally without the use of additional energy. The possibility of the utilization of kyanite containing 63% Al_2O_3 is of definite interest. The method suggested can be adopted for the utilization of clays, etc. A further, more thorough investigation is recommended. M.Ho.

Latest developments in refractories. C. L. Norton, Jr. *Heat Treating & Forging*, **28** [9] 474–76 (1942).—The importance of reliable service and high efficiency has led to the development of many types of insulating firebrick. These brick are essentially firebrick which have been made porous by several methods, e.g., incorporating with the refractory base ingredients a carbonaceous material which will burn out during the firing process. The light weight reduces the heat storage in furnace walls and the heat transmission through the walls. The higher the temperature for which the brick is intended, the heavier will be the weight required for satisfactory service. Insulating firebrick frequently outlast much heavier standard brick. The lighter weight also makes possible savings in the furnace structure and foundations. The reduction in heat storage is particularly important where furnaces are operated intermittently. A table of transmitted heat losses and heat-storage capacities of various types of firebrick walls is included. S.S.

Linings of large basic open-hearth tilting furnaces. A. Jackson. *Engineering*, **154** [4000] 216–17; [4001] 224–25 (1942); *Iron & Coal Trades Rev.*, **145** [3889] 759–61 (1942).—J. describes the working of large 200- to 300-ton tilting furnaces, with reference to the lining. If the brick are not highly resistant, the lining is undermined deeply, the cavity cannot be filled tightly with dolomite, and sinking and collapse will take place. Deep undercuttings may be filled by using a wet chrome-magnesite paste, placed with long-handled shovels and covered with dry dolomite. The type of brick necessary to form a basis for the lining, when in contact with slag or metal, must have a high resistance to reaction and a low shrinkage at high temperatures. Austrian magnesite proved better than brick produced from purer magnesites, probably because of the greater difficulties involved in the production of brick from the purer material. The alternative basic brick, chrome-magnesite and stabilized dolomite, wear away relatively rapidly near the sill level. Experiments indicate that a $7^1/_2$-in. thickness of magnesite is satisfactory for the furnace bottom; about 12 in. of the back bank can be put in with dolomite brick, then about 12 in. of magnesite, followed by not more than 24 in. of dolomite brick. This brings the lining near slag level. About 12 in. of magnesite are used on the bottom of the end banks, and dolomite brick are taken up to the sill level. This is successful, because the end banks have little lining weight to support and the slope is much less steep than at the front and back banks. For the splays, the dolomite brick are taken just above sill level and separated by two or three courses of magnesite brick from the silica above, which is taken right to the roof. For the back lining, chrome-magnesite brick are used from sill level to the roof, with two courses of silica on top. For the front lining, magnesite or chrome-magnesite brick are used to about 12 to 15 in. above sill level, the remainder to the roof being silica. Brick consumption of two 300-ton furnaces is given as follows:

Working weeks	178.6	119.0
Time working (%)	90.8	93.3
Total production (tons)	347,323	230,863
Tons per working week	1945	1948
Brick consumption (lb. per ton)		
Silica brick	16.31	16.74
Firebrick	1.54	1.16
Magnesite	1.92	1.22
Chrome-magnesite	1.13	1.55
Stable dolomite brick	0.82	0.50
Total brick consumption	21.72	21.17

G.A.K. + M.Ha.

Multigrog refractory with a mullite binder. V. A. Rybnikov and P. P. Alimova. *Stekolnaya Prom.*, **1940,** No. 9–10, pp. 13–16; *Khim. Referat. Zhur.*, **4** [3] 86 (1941).—The authors used a grog of varying particle size prepared from Chasov-Yar and Druzhkov clays calcined at 1300° and 1350°. Mixtures of mullite from the same clays and calcined technical alumina were used as binders. The refractory from the Druzhkov grog with the mullite binder was calcined at 1650°; it yielded a dense multigrog suitable for glass-furnace walls having a small apparent porosity (16.3 to 7.6%), a high mechanical strength (1120 to 1210 kgm. per sq. cm.), high load deformation (2 kgm. per sq. cm.), reaching 1575 to 1590°, and an increased heat resistance. Firing at 1580° gave a satisfactory product having less tendency to deform in heat setting. See "High-grog . . .," *Ceram. Abs.*, **17** [11] 354 (1938). M.Ho.

Physicochemical properties of Dinas and mortars for lining furnaces of the Giprokoks system. V. A. Bron. *Koks & Khim.*, **1940,** No. 10, pp. 29–32; *Khim. Referat. Zhur.*, **4** [4] 104 (1941).—B. found that the Dinas produced at the Lenin works has in many instances a lowered mechanical strength. The heat conductivity of the Dinas is satisfactory; the permeability to gases depends on the arrangements of the mortar joints. When the joints are perpendicular to the flow of gases, the permeability of the lining is lowered; their arrangement parallel to the flow increases the permeability. The expansion of the mortars is appreciably less than the expansion of the Dinas. Calcined mortar is more permeable to gases than uncalcined mortar. See "Refractory . . .," *Ceram. Abs.*, **21** [3] 62 (1942). M.Ho.

Production of magnesite refractories from the Sivash. A. A. Alent'ev. *Trudy probleme Sivasha Akad. Nauk S.S.S.R., 1938,* **1940,** pp. 87–94; *Khim. Referat. Zhur.*, **4** [4] 101–102 (1941).—A. outlines a method for the production of $Mg(OH)_2$ and its subsequent conversion into MgO and finally into refractories. The $Mg(OH)_2$ was obtained by the action of milk of lime (10 to 14° Bé.) on Sivash brine having the composition $MgCl_2$ 14.90, $CaCl_2$ 3.78, NaCl 2.96, and $CaSO_4$ 0.071%. The $Mg(OH)_2$ precipitate was filtered in a filter press and washed with water. The product, after washing, contained MgO 57 to 62, water 22 to 29, CaO 3 to 4%, and small amounts of SiO_2 and R_2O_3. The magnesium hydrate was then calcined at temperatures ranging from 600° to 1650°. At 1500° to 1550° the product sintered. From this magnesite clinker of varying granulometric composition, magnesite brick were prepared in the laboratory and calcined at 1450° to 1600°. Clay or sand was used as bonding material. The magnesite brick prepared by this method had satisfactory thermal and mechanical properties. See "Sivash . . .," *Ceram. Abs.*, **19** [9] 223 (1940). M.Ho.

Refractory material for high-temperature furnaces. V. Gulyaev. *Novosti Tekhniki*, **1940,** No. 16, p. 21; *Khim. Referat. Zhur.*, **4** [3] 87 (1941).—The authors successfully experimented with the use of calcined and uncalcined forsterite refractories for the domes of furnaces working at over 1500°. The maintenance of the dome during its working consists in applying a coat of magnesite made of 50 parts by weight of calcined ground magnesite, 50 caustic magnesite, and 8 refractory clay. M.Ho.

Suspended furnace walls give less trouble. George P. Reintjes. *Power*, **86** [4] 248–49 (1942).—Several types of suspended furnace-wall construction are described, and their properties are compared with those of solid furnace-wall construction. Illustrated. F.G.H.

Technology of kyanitic raw material and its industrial utilization. S. M. MILOVIDOV. *Sbornik Leningrad. Geol. Uprav.*, **1940**, No. 5, pp. 75–86; *Khim. Referat. Zhur.*, **4** [4] 103 (1941).—M. discusses the problems encountered in the concentration of minerals of the sillimanite group and the utilization of the concentrates in the aluminum, refractory, and other industries. M.Ho.

SEPARATE PUBLICATION

Test Code for Continuous Vertical Retorts. British Standard Specification No. 1034—1942. British Standards Inst., London. Price 3s 6d.—This is a printed form (with notes) in which to enter the data required for the experimental determination of the yields of the main products for the purpose of evaluating the behavior of a given plant. The notes give full details of the kind of information to be entered and suggestions on carrying out the tests. Some useful notes on guarantee tests are included. A.B.S.

PATENTS

Cast refractory. G. S. FULCHER AND T. E. FIELD (Corning Glass Works). Can. 406,829, Aug. 18, 1942 (Jan. 28, 1941). G.M.H.

Checkerwork. HAAKON HELLAN. U. S. 2,301,400, Nov. 10, 1942 (Jan. 8, 1942).

Firebrick. J. F. MCCLASKEY. U. S. 2,300,683, Nov. 3, 1942 (March 1, 1941).—A refractory brick comprising substantially about 90% clay and alumina, iron, graphite, and silicon carbide in about equal proportions.

Furnace-wall construction. H. W. BEECHER (Gladding, McBean & Co.). U. S. 2,299,874, Oct. 27, 1942 (Nov. 4, 1939). M. L. WEBSTER. U. S. 2,299,864, Oct. 27, 1942 (Oct. 14, 1940).

Magnesium extraction process. PHILIP SADTLER AND S. S. SADTLER (Samuel P. Sadtler & Son, Inc.). U. S. 2,301,457, Nov. 10, 1942 (Nov. 22, 1938).

Making zircon refractories. H. M. SCHLEICHER AND STEVE KOPIN (Scovill Mfg. Co. and U. S. Metal Refining Co.). U. S. 2,303,304, Nov. 24, 1942 (April 14, 1941).—The method of making a ceramic body which comprises preparing a slip containing zircon and china clay in the relative proportions by weight of 94 to 96 zircon and 6 to 4% china clay and water, slip-casting the body, drying, baking, and firing the body, impregnating the fired body with phosphoric acid, and thereafter again firing the body.

Oven for coking of coal. FRANZ PUENING. U. S. 2,299,253, Oct. 20, 1942 (Sept. 12, 1940).

Producing high-quality magnesium compounds from magnesium-containing substances. OCEAN SALTS, LTD., AND J. H. ANDERSON. Brit. 548,197, Oct. 14, 1942 (Feb. 24, 1941).

Production of alumina from clay or other aluminous ore. J. G. STEIN & CO., LTD., AND J. F. HYSLOP. Brit. 548,332, Oct. 21, 1942 (May 21, 1941).

Production of magnesium hydroxide from sea water, brine, etc. OCEAN SALTS, LTD., AND J. H. ANDERSON. Brit. 547,526, Sept. 16, 1942 (Jan. 31, 1941).

Refractory. S. F. WALTON (Exolon Co.). Can. 406,963, Aug. 25, 1942 (Dec. 9, 1940). G.M.H.

Refractory composition. C. J. KINZIE AND EUGENE WAINER (Titanium Alloy Mfg. Co.). Can. 406,591, Aug. 4, 1942 (Dec. 30, 1940; in U. S. Jan. 25, 1940). G.M.H.

Refractory material bonding method. O. G. BENNETT AND L. B. BERGER. Can. 406,130, July 21, 1942 (Feb. 24, 1940; in U. S. April 18, 1939). G.M.H.

Refractory process and product. R. P. HEUER (General Refractories Co.). U. S. 2,301,402, Nov. 10, 1942 (June 27, 1941).—The process of manufacturing nonacid refractory brick of increased intermediate temperature crushing strength which comprises incorporating a member of the first group consisting of pyrophyllite, sericite, and mixtures of the two into a brick mix predominantly composed of a nonacid refractory of the second group consisting of calcined magnesia, chromite, and mixtures of the two, prior to molding of the brick.

Refractory product. H. P. HOOD (Corning Glass Works). Can. 406,062, July 14, 1942 (March 15, 1938; in U. S. June 17, 1937). G.M.H.

Siliceous magnesia refractory manufacture. H. C. LEE (Basic Refractories, Inc.). Can. 406,180, July 21, 1942 (Nov. 22, 1938; in U. S. Jan. 15, 1938). G.M.H.

Terra Cotta

Chemical stoneware for pipe lines. A. C. H. PRYCE. *Ind. Chemist*, **17** [201] 244–46 (1941).—Chemical stoneware is a highly vitrified, dense, ceramic product made from carefully selected raw materials which are subjected to specialized treatment and fired at a temperature of 1250°C. or more. It is different from an ordinary salt-glazed stoneware or enameled fire-clay drainpipe and is produced for an entirely different purpose. The physical characteristics are as follows: tensile strength, 900 to 1500 lb. per sq. in.; compression strength, 45,000 to 75,000 lb. per sq. in.; modulus of rupture, 4000 to 5600 lb. per sq. in.; water absorption, 0 to 3%; specific heat, 0.18 to 0.19 (17° to 100°C.); and linear coefficient of expansion, 4×10^{-6} to 5×10^{-6}. These figures represent normal chemical stoneware, but many special grades are also produced. No metal or other substance has the practically universal resistance to corrosion, coupled with mechanical strength and low price, which, for many purposes, makes chemical stoneware the ideal material for handling liquids or gases. The resistance to abrasion is even higher than that of many ferrous metals. Special grades suitable for the food industries or for pharmaceutical work are produced in a white body with a white glaze inside and out. The spigot and socket joint is used where there is little or no internal pressure. Conical flanged pipes are used for acid mains, pump lines, vacuum lines, pressure gas lines, etc., and will withstand high internal pressures or complete vacuum. Pipes up to 4-in. bore are regularly tested hydraulically to pressures of 100 lb. per sq. in. Methods of installation of chemical stoneware equipment are discussed. Chemical stoneware pipe lines have been installed in Britain in chemical works, paper mills, textile mills, and in the food industries. See *Ceram. Abs.*, **21** [1] 17 (1942); "Industrial . . .," *ibid.*, [8] 172; "Nonmetallic . . .," *ibid.*, [10] 216. E.D.M.

Ornament in building. ANON. *Keram. Rundschau*, **46** [9] 91–93 (1938).—Renewed interest is being shown by architects in novel treatments of ceramic ornamentation, including decorative tile, mosaic, friezes, and plaques made by a technique similar to that used for stained glass windows. M.V.C.

Plant for manufacturing stoneware tile. B. BASSA. *Keram. Rundschau*, **46** [1] 3–5; [2] 17–18 (1938).—The layout and operation of plants producing stoneware tile by the semiwet method are described. M.V.C.

Porphyrylike tile used for the Palace of Soviets. N. CHERNYAK AND L. MISHULOVICH. *Novosti Tekhniki*, **1940**, No. 21–22, pp. 56–57; *Khim. Referat. Zhur.*, **4** [4] 105 (1941). M.Ho.

Practical experience in the manufacture of stoneware pipe. JOSEF GREWE. *Keram. Rundschau*, **45** [33] 369–72; [34] 388–90; [35] 397–98 (1937).—Pointers on the selection, mixing, and preparation of raw materials and the drying, charging, and firing of the ware and suggested changes in furnace structure and types of fuel are given as aids in improving production. M.V.C.

Testing the acid stability of ceramic products. ANON. *Keram. Rundschau*, **45** [38] 431–32 (1937).—The work of W. Hornke on testing the stability to acids of ceramic products to make them more useful in chemical industries is reviewed. Mechanical and thermal testing methods are more or less standardized, but tests for chemical stability are not. The reason for this lack of coordination is that the different factors involved have not been thoroughly

studied. Acids have a twofold action: (1) a chemical corrosion, which depends on the kind, amount, and concentration of the acid, the heating time and temperature, the porosity and grain size of the material, and air pressure; and (2) mechanical action, which causes a crystallizing out of the salts because of their reaction with the acids and which depends on the kind of salts formed, the state of the pores, and the stability of the body. M.V.C.

PATENTS

Coated or color granular material. H. B. BURTON, JR. (Minnesota Mining & Mfg. Co.). U. S. 2,298,277, Oct. 13, 1942 (April 1, 1939).—As a new article of manufacture, granules adapted for use as roofing granules, etc., having on the exterior an adherent coating produced by reacting at temperatures in excess of about 1600°F. *in situ* on surfaces of the granules a mixture of coating ingredients comprising sodium dichromate, a water-soluble divalent metal salt including an iron salt, a water-soluble borate, and a finely divided solid carbonaceous reducing agent including material from the class consisting of coal and coke, the dichromate being present in substantial proportion but to a lesser extent by weight than the divalent metal salt, the finely divided carbonaceous reducing agent being present to greater extent by weight than the dichromate, and the borate being present to an extent by weight such that, when figured on a mole basis and on the basis of B_2O_3, the B_2O_3 will be present to the extent of at least 0.3 but not to a greater extent than 0.6 of the Na_2O content of the coating, the latter also being figured on a mole basis, the coating being weather-resisting in character and substantially free of water-soluble salts.

Coated or colored granular material. H. B. BURTON, JR. (Minnesota Mining & Mfg. Co.). Can. 405,945, July 7, 1942 (March 30, 1940; in U. S. April 1, 1939). G.M.H.

Urinal. LEEDS FIRECLAY CO. AND J. G. JOHNSTON. Brit. 547,507, Sept. 9, 1942 (March 7, 1941).

Whiteware

Causes of flaws in the manufacture of porcelain. W. NEIDHART. *Keram. Rundschau,* **45** [52] 603–604 (1937).—Measures for the prevention of flaws are mentioned. The body should be sufficiently plastic to be easily worked and should not split on the mold; it should have a low shrinkage and withstand fire to prevent the formation of stresses. A too fat body will warp. In damp weather the soda used for the batch takes up moisture and must be dried before use, or the soda addition will be deficient and the slip insufficiently fluid. The template must be polished clean to prevent streaks, etc., in the ware. Flue gases injure unprotected articles during firing. In the glazing room, the ware should be tested for pressure flaws, recognized by a dull sound when tapped. Black points and smokiness are caused by flue gases during stoking. Yellow color and blisters form during glow heat if cold air is drawn into the grate. M.V.C.

Celebrating 175 years of Berlin state porcelain manufacture. J. GR. *Keram. Rundschau,* **46** [47] 547–50 (1938).—Fine pieces of Prussian porcelain are described. Illustrated. M.V.C.

Ceramic high-frequency insulators. E. ROSENTHAL AND J. E. NICKLESS. *Wireless World,* **47,** 281 (1941); *Trans. Brit. Ceram. Soc.,* **41** [4] 57A (1942).—The characteristics of several new types of ceramic insulating materials are described.

Feldspathic glazes fired at 1200° to 1300°. V. P. ZUBCHANINOV AND T. S. LEKAREVA. *Sbornik Trudov Leningrad Tekh. Inst. VSPK,* **1940,** No. 2, pp. 38–50; *Khim. Referat. Zhur.,* **4** [3] 85 (1941).—Experiments showed that low-melting feldspathic glazes can be obtained at 1200° to 1300°. The lowering of the firing temperature from that commonly used (over 1300°) is obtained by including in the composition of the glaze ZnO, native borates, and a mixture of feldspars (microcline and plagioclase). Raw feldspathic glazes can be used for porcelain, faience, and stoneware. M.Ho.

History of Ludwigsburg porcelain manufacture. ANON. *Keram. Rundschau,* **45** [27] 300–302 (1937).—The Ludwigsburg porcelain factory was one of the great German factories of the 18th century. Some of its best-known artists and their works are mentioned. M.V.C.

Laboratory stand. A. I. GUNDER. *Zavodskaya Lab.,* **9** [10] 1156–57 (1940); *Khim. Referat. Zhur.,* **4** [4] 84 (1941).—G. suggests the use of faience instead of iron for laboratory equipment such as stands, rings, filter stands, etc. He has used such equipment in his laboratory for two years. The faience equipment not only gives a neater appearance but also prevents contamination from scaling iron rings, etc. M.Ho.

Notes on the constitution of steatite. HANS THURNAUER AND A. R. RODRIGUEZ. *Jour. Amer. Ceram. Soc.,* **25** [15] 443–50 (Nov., 1942).—12 references, 11 figures.

Production control and operational statistics. FRIEDRICH LIPINSKI. *Keram. Rundschau,* **46** [5] 45–47 (1938).—To check the quantity of raw materials received with the amount of finished ware they yield, a record was kept at a porcelain factory of the weight of materials received and lost at each separate stage of production: milling and preparation, molding, drying, firing, glazing, glost firing, etc. The control data obtained furnish definite information on the efficiency of the plant as a whole and of each of its separate branches. M.V.C.

Radio interference-proof insulators. R. A. SNYDER. *Ceram. Age,* **37** [1] 7–8 (1941).—One important source of radio interference is the normal arcing flow of charging current into insulators carrying distribution and transmission lines through or near thickly populated sections. It can now be eliminated as the result of the development of glazes having properly controlled electrical conductivity. When such glazes are applied over specified surfaces of the insulator, the charging current is introduced into the insulators without arcing, and radio interference disappears. An extensive fundamental investigation was made to determine which of the metallic oxides would produce adequate electrical conductivity when incorporated in glazes and fired to cone 11 without affecting any other electrical characteristic of a given insulator. The best conductivity can be obtained by use in the glaze compositions of oxides of nickel, copper, manganese, and iron. Electrical conductivity may be varied over an extremely wide range by changes in the proportions of metallic oxides used. This is convenient, as it permits complete and accurate application to a given insulator design. The method of application, either dipping or spraying, is determined by design considerations. Depending upon requirements, the glaze may be applied over the bare porcelain or over the standard-type brown porcelain glaze. While the search for satisfactory electrical conductivity was the primary objective, other properties were also investigated. The hardness and smoothness of these coatings are satisfactory, and insulators so treated will withstand abrasion in service and retain their "self-cleaning" properties after long exposure to the weather. Chemical stability has been established to guarantee permanent silence. Illustrated. F.G.H.

Relation between chemical composition and dielectric properties of ceramic materials with low dielectric losses. M. D. RIGTERINK, R. O. GRISDALE, AND S. O. MORGAN. *Jour. Amer. Ceram. Soc.,* **25** [15] 439–43 (Nov., 1942).—6 references, 5 figures.

Symposium on testing and classification of ball clays: Introduction. RALSTON RUSSELL, JR. *Bull. Amer. Ceram. Soc.,* **21** [11] 248 (1942). **Classification of ball clays.** ARTHUR S. WATTS. *Ibid.,* p. 249.—2 references. **Ball clay in electrical porcelain bodies.** L. E. THIESS. *Ibid.,* pp. 250–52.—5 references, 5 figures. **Testing ball clays for low-tension electrical insulators.** ARTHUR J. BLUME. *Ibid.,* p. 252. **Use of ball clay in sanitary ware.** JAMES R. BEAM. *Ibid.,* p. 253. **Use of ball clay in vitreous hotel-**

china bodies. R. E. GOULD. *Ibid.*, pp. 253–54. **Function of ball clay in vitreous bodies.** EDWARD SCHRAMM. *Ibid.*, p. 255. **Discussion on semivitreous whiteware.** J. W. HEPPLEWHITE ET AL. *Ibid.*, p. 256. **Discussion of classification of ball clays by means of fundamental and physical test data.** RALSTON RUSSELL, JR. *Ibid.*, pp. 256–57. **Particle-size determinations.** G. A. LOOMIS. *Ibid.*, p. 257.—8 references. **Critical analysis of Stokes' law as a basis for the determination of particle size of clays and nonplastic materials.** R. M. KING. *Ibid.*, pp. 258–60.—6 references. **Particle shape and the behavior of clay as revealed by the electron microscope.** R. P. HUMBERT. *Ibid.*, pp. 260–63.—2 references, 12 photomicrographs. **Method of determining the pH of ball clays.** GEORGE J. BARKER AND EMIL TRUOG. *Ibid.*, pp. 263–65. **Soluble constituents.** K. C. MCCARTT. *Ibid.*, pp. 266–67.—3 references, 2 figures. **Mineralogical and rational analysis of ball clays.** T. N. MCVAY. *Ibid.*, pp. 267–68.—2 references. **Water of plasticity.** J. W. WHITTEMORE. *Ibid.*, pp. 268–69.—2 references. **Plasticity and workability of ball clays.** E. C. HENRY. *Ibid.*, pp. 269–71.—14 references. **Evaluation of plastic properties of clay masses.** RALSTON RUSSELL, JR. *Ibid.*, pp. 271–74.—19 references. **Casting-rate tests.** C. M. LAMBE. *Ibid.*, pp. 274–76. **Oxidation of ball clays.** G. A. BOLE. *Ibid.*, pp. 276–77.—3 references. **Fired color of ball clays.** ISAY A. BALINKIN. *Ibid.*, pp. 278–81.—5 references, 3 figures. **Clays and test bodies.** R. M. CAMPBELL. *Ibid.*, pp. 281–82. **Sample selection and aging.** C. M. FRANZHEIM. *Ibid.*, pp. 282–83. **Testing and classification of ball clays: thermal history.** C. G. HARMAN AND C. W. PARMELEE. *Ibid.*, pp. 283–86.—3 references, 11 figures. **Testing whiteware clays.** HEWITT WILSON AND HERSCHEL HIXON. *Ibid.*, pp. 287–91.—3 references, 8 figures.

BOOKS

Literature Abstracts of Ceramic Glazes. Compiled by J. H. KOENIG AND W. H. EARHART. Industrial Publications, Inc., Chicago, 1942. 285 pp. Price $3.—This book comprises a complete review of glazes in abstract form. In most cases the abstracts are so complete that reference to the actual article is unnecessary. The book is divided into several sections, each covering one publication. The first section covers papers from the *Journal of the American Ceramic Society*, the second covers papers from *Ceramic Industry*, etc. More than eighty publications are included, the foreign journals being thoroughly abstracted. Books, patents, and government specifications are covered, and a complete cross index makes the use of the book simple and convenient. Especially interesting at this time, with tin uses being limited by government order, are the references and abstracts of articles on opacity in glazes. Many users of tin as an opacifier are running low on their reserve stocks and must eventually find a substitute. Papers abstracted deal with terra cotta, chinaware, semiporcelain, artware, sanitary ware, electrical porcelain, brick, enameled brick, sewer pipe, chemical porcelain, stoneware, flowerpots, and cooking ware.

Proceedings of the All-Union Conference of Heat Technologists of the Porcelain and Faience Industry, Jan., 1939. Moscow, 1940. 132 pp. Reviewed in *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.Ho.

Technology of Porcelain and Faience Production. S. G. PULIEZO. Gizmestprom, Moscow and Leningrad, 1940. 528 pp. Price 17 R. Reviewed in *Khim. Referat. Zhur.*, **4** [3] 85 (1941). M.Ho.

PATENTS

Electrical apparatus. E. B. NOWOSIELSKI (Bendix Aviation Corp.). U. S. 2,301,571, Nov. 10, 1942 (June 26, 1929; renewed July 13, 1932).

Fluorescent artificial teeth. CHARLES DIETZ (Dentists' Supply Co. of New York). U. S. 2,301,174, Nov. 10, 1942 (Sept. 23, 1941).—A porcelain artificial tooth having a fluorescence comparable to the fluorescence of natural teeth when viewed in ultraviolet light, the tooth comprising a body portion and a relatively transparent enamel portion, both the body portion and enamel portion having uranium therein to impart fluorescence, the uranium content of the body portion exceeding the uranium content of the enamel portion, and the uranium content of the body portion varying from 0.01 to 0.1% by weight.

Insulator bushing. H. J. FLAHERTY (General Electric Co.). U. S. 2,300,913, Nov. 3, 1942 (July 22, 1941).

Manufacture of ceramic insulators. PHILIPS LAMPS, LTD. (N. V. Philips' Gloeilampenfabrieken). Brit. 548,651, Oct. 28, 1942 (Nov. 29, 1941).

Metal-porcelain-glass vacuum-tight structure. P. R. KALISCHER AND M. J. KOFOID (Westinghouse Electric & Mfg. Co.). U. S. 2,300,931, Nov. 3, 1942 (June 28, 1940).

Method and apparatus for manufacture of pottery ware. W. J. MILLER AND A. J. REEK (W. J. Miller). U. S. 2,301,906, Nov. 10, 1942 (Aug. 21, 1939).

Production of ceramic bodies. E. H. FISCHER (Westinghouse Electric & Mfg. Co.). U. S. 2,301,939, Nov. 17, 1942 (July 31, 1940).—The method of forming a complete electrical porcelain body of intricate shape preparatory to drying and firing, the body to have a uniform density comparable to wet-process porcelain, comprising introducing a predetermined quantity of granulated porcelain material having a moisture content of from 14 to 18% into a mold consisting of relatively movable metallic dies, manually tamping portions of the material so that portions thereof are initially denser than others, compressing the material between the dies, evacuating air from the material during the compressing operation, then separating the dies, and removing the completed body for drying and firing.

Refractory insulating material for electrical heaters. LOUIS KREIGER (Canadian General Electric Co., Ltd.). Can. 406,939, Aug. 25, 1942 (Oct. 14, 1939). G.M.H.

Spark plug. C. R. BUENING (Globe-Union, Inc.). U. S. 2,300,646, Nov. 3, 1942 (Dec. 20, 1940). J. A. DORAN. U. S. 2,301,686, Nov. 10, 1942 (Feb. 8, 1940). E. B. NOWOSIELSKI (Bendix Aviation Corp.). U. S. 2,301,570, Nov. 10, 1942 (July 1, 1930; Nov. 15, 1934). U. S. 2,301,573, Nov. 10, 1942 (May 1, 1930). F. A. OST. U. S. 2,298,504, Oct. 13, 1942 (June 10, 1940). U. S. 2,299,924, Oct. 27, 1942 (April 11, 1941).

Spark plug. C. M. CARINGTON (K. L. G. Sparking Plugs, Ltd.). Can. 406,712, Aug. 11, 1942 (Oct. 21, 1940). Can. 406,713, Aug. 11, 1942 (Oct. 25, 1940). PAUL EBELHER. Can. 406,790, Aug. 18, 1942 (Dec. 18, 1939). FRED KAPP. Can. 407,198, Sept. 8, 1942 (Dec. 21, 1940). F. R. F. RAMSAY (D. Napier & Son, Ltd.). Can. 407,307, Sept. 8, 1942 (March 5, 1941). G.M.H.

Spark plug having a mica insulator for internal combustion engines. ENRICO ZANZI (vested in Alien Property Custodian). U. S. 2,301,990, Nov. 17, 1942 (Oct. 29, 1940).

Spark-plug structure. E. B. NOWOSIELSKI (Bendix Aviation Corp.). U. S. 2,301,572, Nov. 10, 1942 (Aug. 2, 1929).

Tableware article. M. E. BOTTOME. Can. 406,889, Aug. 25, 1942 (Sept. 22, 1941). G.M.H.

Equipment and Apparatus

Adding years to compressor life. CHARLES W. GIBBS. *Factory Management & Maintenance*, **100** [9] 129–31 (1942).—Methods of caring for compressors are treated. Oiling, cleaning, and water and air intakes are discussed. N.R.S.

Apparatus for particle-size analysis. ANON. *Engineering*, **154** [3997] 141–42; [3999] 181–82; [4001] 221–23; [4002] 241–42 (1942).—A new form of photographic sedimentation apparatus is described, and results of performance tests of this instrument are compared with those of a number of other types of apparatus. Exhaustive tests show that the photo-sedimentation apparatus gives correct absolute values of size grading, that random errors do not affect the result by more than a small per-

centage, and that it can be regarded as a standard of particle sizing within the range 2 μ to 100 μ. The principle involves photographing the tracks of particles as they fall in a stagnant liquid under gravitational attraction. The length of track of each particle, for a certain time of exposure, is a measure of its falling speed, from which the diameter of the equivalent sphere can be computed by Stokes' law. 10 drawings, 3 photographs. G.A.K.

Artificial resins and their use for bushing casings and cog wheels. ANON. *Keram. Rundschau*, **45** [34] 386–88 (1937).—Figures showing the durability of artificial resins for machine parts, especially bushings and driving gear, are given. M.V.C.

Calculating a concentrator of the Dorr type. N. I. MALAKHOVSKIĬ. *Trudy Vsesoyuz. Nauch.-Issledovatel. Ugol'nyĭ Inst. (VUGI)*, **3**, 213–38 (1940); *Khim. Referat. Zhur.*, **4** [3] 114–15 (1941).—M. gives the accepted methods and the method of VUGI for calculating a Dorr-type concentrator. The method of VUGI was worked out in the laboratory on a number of geometrically similar models of various scales; it was subsequently tested on a laboratory-type Dorr concentrator. The following formula was derived for the area: $F = \frac{Q_0}{V_{max}}(2 - \beta)$m.², where Q_0 is the required output in cu. m. per hr., β is the output of the concentrate in parts of the entering pulp and is equal to $\frac{a - c}{b - c}$, V_{max} is the sedimentation velocity of the largest particles in the overflow, a is the solid content of the entering pulp, b is the solid content in the concentrate, and c is the solid content in the overflow in grams per liter. If samples cannot be conveniently taken, it can be assumed in the case of slimes of the Don coal that $a = 130$ gm. per liter and $c = 85$ gm. per liter. V_{max} is determined by the formula of Kurakov: $V_{max} = 43.2 \times d \frac{\gamma_y - \gamma_n}{\gamma_n}$ m. per hr., where d is the diameter of the largest particles in the overflow and is equal to 0.33 mm., γ_y is the specific gravity of the solids entering the concentrator, and γ_n is the average specific gravity of the pulp entering the concentrator and the pulp in the overflow and is given by: $\gamma_n = \frac{1000 + \frac{(a + c)(\gamma_y - 1)}{2\gamma_y}}{1000}$. Sample calculations are given. M.Ho.

Code of a foreman. CHARLES REITELL. *Factory Management & Maintenance*, **100** [9] 108–109 (1942).—The role of the foreman in plant life is discussed. N.R.S.

Color pyrometer. ANON. *Jour. Sci. Instruments*, **19** [10] 159 (1942).—A new color pyrometer for measuring temperatures in the range 900° to 1800°C. is described. It is based on the fact that, in the spectrum of a radiating body, the ratio of the intensities of two different colors, i.e., a red of 7030-a.u. wave length and a green of 5250 a.u., depends on the temperature of the body. G.A.K.

Device for automatically and evenly raising the temperature of electric kilns. F. I. VASENIN. *Zavodskaya Lab.*, **9** [8] 927 (1940); *Khim. Referat. Zhur.*, **4** [3] 66 (1941).—This device is used to regulate and raise the temperature of electric muffles in a predetermined manner. It is particularly useful for thermal analysis. It consists of a drum upon which is wound a resistance wire which gradually increases from 1 to 2.5 mm. in diameter and a sliding contact. The drum is turned by a small one-phase reversible motor geared to a worm. When it is desired to keep the temperature of the muffle constant, the sliding contact is broken. M.Ho.

Equipment for determining moisture in coal. New type of equipment. O. W. REES AND K. F. BURSACK. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 729–31 (1942).—Illustrated. F.G.H.

Maintenance and replacement of apparatus in the ceramic industry. FR. L. *Keram. Rundschau*, **45** [47] 539–41 (1937).—When an old furnace, mill, mixer, boiler, or other machine becomes inefficient and production falls off, the problem of whether it should be repaired or replaced by an entirely new and improved model involves not only the question of the initial cost but also the resulting production capacity, output, and service. These factors must be calculated carefully with the help of logarithmic tables, slide calculators, and other accurate aids before a decision can be made. M.V.C.

Mars kryptol furnace. V. A. LEBEDEV. *Zavodskaya Lab.*, **9** [8] 918–20 (1940); *Khim. Referat. Zhur.*, **4** [4] 103 (1941).—A Mars kryptol furnace is described. To bring the temperature to 1200° requires 1 hr. and 40 min. using a maximum current of 15 amp. at 127 v.; the temperature is ±20°. To heat the furnace to 1500°, 20 amp. are required and for 1650° 25 amp. are required. The servicing of the furnace is simple. Observations on the continuous work of this furnace indicate that the use of a Mars kryptol furnace will become widespread to replace the lacking platinum. See "Furnace . . .," *Ceram. Abs.*, **20** [1] 23 (1941). M.Ho.

Metering flow. F. A. ANNETT. *Power*, **86** [2] 87–106 (1942).—A. presents a broad outline of flowmetering devices and their principles of design, operation, and application. Illustrated. F.G.H.

Parallel versus individual operation of multicyclones. L. C. WHITON, JR. *Trans. Amer. Soc. Mech. Engrs.*, **63** [3] 213–18 (1941). W. discusses the problem of determining the comparative efficiencies of individual cyclone-type dust collectors and cyclones grouped with interconnecting ducts and hoppers. The test setup and procedure followed are described fully, and the results are completely tabulated. With a damper-equipped cyclone of the size used in actual practice and operated under identical conditions of resistance and temperature, performance of the individual cyclone is representative of the group in the field. Illustrated. F.G.H.

Preparing bodies in ceramics. ANON. *Keram. Rundschau*, **45** [24] 261–63 (1937).—Apparatus developed by modern machine technique that have proved useful in the preparation of bodies and for other uses in the ceramic industry are illustrated and discussed. M.V.C.

Rapid method for determination of porosity. O. S. GORODETSKIĬ. *Ogneupory*, **1940**, No. 8–9, pp. 468–69; *Khim. Referat. Zhur.*, **4** [4] 102 (1941). M.Ho.

Thermal insulating materials for industrial equipment. S. V. SAGINOR. *Product Eng.*, **13** [9] 494–97 (1942).—Close temperature control for efficient operation in industrial processes depends to a large extent on the heat-insulating materials used. Factors to be considered when selecting and specifying insulating materials are discussed, and installation methods are described. Physical and thermal characteristics of commercial insulating materials are given in a table. M.Ha.

Thermometric time lag. RUDOLF BECK. *Trans. Amer. Soc. Mech. Engrs.*, **63** [6] 531–43 (1941).—B. presents the facts and the theory of thermometric time lag in a form suitable for industrial users of thermometers. Emphasis is placed on the distant-reading type of thermometer, actuated by liquid expansion (mercury or other liquids), gas expansion, or vapor pressure, and mercury-in-glass thermometers. Illustrated. F.G.H.

BOOK

14,000 Gear Ratios. RAY M. PAGE. Industrial Press, New York, 1942. 404 pp. Price $5. Reviewed in *Can. Machinery*, **53** [10] 153 (1942).—The book contains 14,000 two-gear combinations and millions of possible four-gear combinations. Tables are presented in both common fractional and decimal forms. E.D.M.

PATENTS

Abrasive control unit. L. L. HOBSON (H. S. Toy). U. S. 2,298,564, Oct. 13, 1942 (Dec. 12, 1940).

Apparatus for drilling diamonds, etc. GENERAL ELECTRIC CO., LTD., AND C. G. EDEN. Brit. 548,246, Oct. 14, 1942 (Jan. 31, 1941).

Apparatus and method for simultaneously forming male and female molds. A. McK. GREAVES-WALKER (Libbey-Owens-Ford Glass Co.). U. S. 2,302,764, Nov. 24, 1942 (March 27, 1940; April 21, 1941).

Centrifugal separators. A. H. STEVENS (Sharples Corp.). Brit. 548,623, Oct. 28, 1942 (Oct. 25, 1941).

Coating machine. J. H. GORDON, JR. (American Can Co.). U. S. 2,298,289, Oct. 13, 1942 (Aug. 27, 1940).

Form for slip-casting ceramics and method of making. H. M. SCHLEICHER (Scovill Mfg. Co.). U. S. 2,303,303, Nov. 24, 1942 (April 14, 1941).

Instruments for measuring roughness of surfaces. G. A. TOMLINSON. Brit. 547,462, Sept. 9, 1942 (Feb. 27, 1941).

Lens assembly for industrial safety helmets. J. F. CLARK (Willson Products, Inc.). U. S. 2,301,018, Nov. 3, 1942 (Dec. 10, 1941).

Melting tank and apparatus for cooling seams thereof. H. H. BLAU AND K. K. KNAELL (Carborundum Co.). U. S. 2,299,608, Oct. 20, 1942 (Oct. 15, 1937; Sept. 19, 1939).—A material melting tank comprising cast refractory blocks forming walls, the engaging faces of the blocks being formed with complementary grooves defining a passage, the passage being entirely between and spaced from the inner and outer confines of the wall, means for supplying cooling gas to the passage to solidify molten material tending to escape through the joints between the blocks, an apertured conduit positioned in the passage, and means for supplying cooling liquid to the conduit to control the temperature of the cooling gas in the passage.

Kilns, Furnaces, Fuels, and Combustion

Abnormality of flame gases. W. T. DAVID. *Nature*, **150** [3802] 320–21 (1942).—It is becoming increasingly recognized that flame gases hold a latent energy, and because of this an abnormal amount of dissociation obtains in them. Experiments suggest that a rapid partitioning of the vibratory energy takes place and that the amount of this energy is at all times after combustion governed by the flame-gas temperature. See "Latent . . .," *Ceram. Abs.*, **20** [11] 269 (1941). G.A.K.

Automatic burning control in rotary kilns. WILLIAM E. REASER. *Trans. Amer. Soc. Mech. Engrs.*, **64** [4] 265–73 (1942).—Significant developments in automatic regulation of the burning process in rotary cement kilns have occurred in the last decade, but general application of control devices has proceeded slowly. R. discusses achievements in the field, through reference to diagrams, charts, and illustrations, to bring about a more universal understanding and to establish a background for further experimentation. Although the discussion pertains especially to cement-clinker burning, the same basic principles of control are applicable to many other manufacturing processes employing rotary kilns. F.G.H.

Calculating ceramic furnaces by the heat-balance method. A. D. TSEPIN. *Sbornik Trudov Leningrad. Tekh. Inst. Vsekopromsoveta im. V. M. Molotov*, **1940**, No. 3, pp. 23–37; *Khim. Referat. Zhur.*, **4** [3] 114 (1941).—Instead of calculating the fuel used from the heat balance of the entire furnace, T. gives equations for calculating heat balances of separate portions of a ceramic furnace, such as the preheating, firing, cooling, etc., zones. This gives the fuel used for the different operations. Four equations are derived for determining the use of fuel and the firing temperature from the temperature of the exit gases, the coefficient of excess air, the temperature of the air, and the heat of reaction. Inasmuch as the last can be fairly closely approximated, the remaining four unknown are determined by the four equations. T. gives graphs showing the nature of changes of the above values determined from the temperature of the escaping gases. A sample calculation for a shaft furnace for calcining limestone is given. M.Ho.

Coal resources of Washington. JOSEPH DANIELS. *Trans. Amer. Soc. Mech. Engrs.*, **63** [4] 289–92 (1941).—Coal is the principal mineral fuel resource of Washington, overshadowed at present by the water-power developments at Bonneville and Grand Coulee. No petroleum is produced commercially, but there is a small production of natural gas. Wood, forest and mill, obtained largely as waste products of the lumber industry, is used extensively for heat, power, and industrial purposes. D. discusses the location of coal regions, the characteristics of Washington coals, mining operations, transportation, the cost of coal, and other factors, giving a comprehensive idea of the production and use of this fuel in the Pacific Northwest. F.G.H.

Combustion of pulverized fuel. Mechanism and rate of combustion of low-density fractions of certain bituminous coals. A. A. ORNING. *Trans. Amer. Soc. Mech. Engrs.*, **64** [5] 497–508 (1942).—O. studied individual particles of burning coal, using all convenient means of observing the burning process and examining the residues obtained. With Pittsburgh seam coal and Pocahontas No. 3 seam coal, it was found that the particles were blown into cenospheres before they ignited. The exposures just required to make an impression on the photographic film were used to estimate the temperature history of individual particles. With the available furnace temperatures, less than 1000°C., the degree of combustion depended upon the ability of the particles to maintain themselves above about 1400°C. The degree of combustion increased with increasing furnace temperature in the region where the cenospheres were formed. Photographs of partially burned cenospheres and data on the relation of particle size to burning time were obtained. Illustrated. F.G.H.

Densities of liquefied petroleum gases. NATURAL GASOLINE ASSN. OF AMERICA, TECHNICAL COMMITTEE. *Ind. Eng. Chem.*, **34** [10] 1240–43 (1942).—The liquid densities for propane, isobutane, *n*-butane, and *n*-pentane were determined for the temperature range −50° to 140°F. and for propylene and 1-butene from 0° to 60°F. The densities of approximately equimolar mixtures of propane-isobutane and *n*-butane–*n*-pentane were measured from 20° to 100°F. These new densities for propane and *n*-pentane and values found in the literature agree, in general, very well. Values for isobutane and *n*-butane in the literature are in marked disagreement among themselves and with the figures reported here. When compared with the other published values, the new densities are somewhat lower for isobutane and somewhat higher for *n*-butane. The agreement of this work with previously published densities for 1-butene is good. Considerable difference was found for propylene. The two mixtures investigated do not appear to deviate appreciably from perfect solutions. Illustrated. F.G.H.

Firing of pottery. A. BERNARD HOLLOWOOD. *Ind. Chemist*, **17** [202] 267–68 (1941).—For some clayware one firing is sufficient; others require a biscuit firing and a glost firing, while overglaze decoration involves a third heat-treatment. The old bottle-neck kilns are being superseded by continuous tunnel kilns fired by gas, oil, or electricity. A normal intermittent biscuit kiln is 18 ft. in diameter and 20 ft. high and will accommodate about 1800 saggers. A smaller kiln is more wasteful of fuel, and a larger one is increasingly difficult to manipulate manually. The biscuit kiln fires at about 1100°C. and consumes at least twice as much fuel as the weight of goods produced. About 60 hr. are needed to fire the kiln, and a similar period must elapse before the ware can be drawn, so that the cycle of firing operations occupies about a week. The intermittent kiln is inefficient in the use of fuel, as firing is dependent to some extent on the weather, on the quality of fuel, and on the skill of the placer and fireman. The structure gives rise to differential heating zones, and losses through firing defects are considerable in all types of pottery. In tunnel firing, trucks stacked with pottery pass slowly through a heated chamber and emerge ready for the

next process. The intricacies and dangers of kiln placing are abolished, the cycle of operations is reduced, and firing can be scientifically regulated with a saving in fuel. Labor costs are reduced from 25% to 50%, and the quality of the ware is greatly improved. Oil, town gas, producer gas, electricity, coal, pulverized pitch, creosote, and tar are used as fuels. Temperature control is automatic. Gas has been favored as a biscuit- and glost-firing fuel, while electricity is used in enamel furnaces where lower temperatures are recorded. The new Wedgwood factory, however, is entirely electrical ("Firing . . .," *Ceram. Abs.*, **21** [3] 66 (1942)). The advantages of the tunnel kiln are as follows: (1) Because of continuous employment at a constant temperature, there is less wear and tear on its structure. (2) It avoids the loss of time involved in intermittent heating and cooling. (3) It facilitates the loading and unloading of goods. (4) It may eliminate the use of saggers or minimize their depreciation. See "Decoration . . .," this issue, p. 2. E.D.M.

Flow processes in underfeed stokers. MARTIN A. MAYERS. *Trans. Amer. Soc. Mech. Engrs.*, **63** [6] 479–89 (1941).—M. considers the types of flow of materials in underfeed multiple-retort stokers. Such flow studies include (1) solids, such as the fuel and ashy refuse; (2) gases, such as air and the products of combustion; and (3) heat, especially that portion which recirculates within the bed and leads to preparation and ignition of the fuel. The types of flow have a definite bearing on the maintenance of the fixed pattern in the fuel bed which has been observed at each tuyère stack and the adjacent retort. From the data compiled, M. develops the features which would be possessed by a stoker designed for much higher duty than any now in existence and analyzes the possible results to be attained. Illustrated. F.G.H.

Fuel-bed tests at Hell Gate Generating Station, 1937–1938. M. A. MAYERS, W. H. DARGAN, JOSEPH GERSHBERG, B. C. DALWAY, M. J. WILLIAMS, AND E. R. KAISER. *Trans. Amer. Soc. Mech. Engrs.*, **63** [3] 191–211 (1941).—This paper is a final report on fuel-bed tests at Hell Gate Generating Station and includes some of the conclusions reached in the authors' study of the data up to this time. The fuel bed of a multiple-retort underfeed stoker consists of vertical strata parallel to the center lines of the retorts and tuyère stacks in which coking and ignition processes occur along the entire length of the stoker. The actual burning of the carbonized fuel occurs largely by overfeed action in the burning lanes where the temperature and pressure gradients are determined by the rate of primary-air flow, and the gases rising from the burning lanes may require the addition of secondary air for complete combustion. Control of the contour of the fire in operating practice may affect not only the amount of coke blown from the fire and the degree of gas stratification in the boiler passes but also the severity of treatment to which the stoker iron is subjected. Illustrated. F.G.H.

High-temperature recuperators. J. B. WAGSTAFF. *Jour. Soc. Glass Tech.*, **26** [113] 5–21T (1942).—The size of a recuperator may be calculated from considerations of heat transfer with reasonable accuracy by taking into account the heat flow from the waste gases to the tubes and from the tubes to the air separately. Much heat may be recovered from the waste gases if brick baffles are constructed among the tubes; the brickwork reradiates the heat energy to the tubes. Equations pertaining to heat transfer are included. Metal construction principles are also dealt with. R.H.B.

Kilns for craft potters. ANON. *Bull. Amer. Ceram. Soc.*, **21** [10] 234 (1942).—Simple rules are given for the care and maintenance of kilns to obtain properly fired ware, the lowest fuel consumption, uninterrupted production, and a long kiln life with minimum repair.

Practical calculations for wood firing. L. KIENBERGER. *Keram. Rundschau*, **45** [22] 240–41 (1937).—To determine the water content and calorific value of wood, a special setup is necessary which is not available in some ceramic plants. K. describes a simple and easy method that gives good results. M.V.C.

Problems in pulverizing and burning Midwest coals. A. C. FOSTER. *Trans. Amer. Soc. Mech. Engrs.*, **64** [3] 169–75 (1942).—F. cites the characteristics of Midwest coals which require special consideration in the design of pulverizers and boiler furnaces to meet the conditions of combustion. The principal items to be provided are (1) large furnace volume with moderate heat-release rates, (2) ample furnace cooling surface, (3) preheated air at sufficient temperature to enable the pulverizer to pulverize coal with maximum moisture content which may be encountered, and (4) ample mill capacity. A discussion of these elements in the solution of the problem of burning Midwest coals efficiently is included. Illustrated. F.G.H.

Progress in the construction of periodic kilns. FRIEDRICH LIPINSKI. *Keram. Rundschau*, **45** [48] 551–53; [49] 566–68; [50] 578–80 (1937).—German patents for improvements in the construction of furnaces with a single firing chamber cover such features as the shutting off of zones which fall short of the correct temperature during firing, increasing the operating efficiency of two-story chamber kilns, and greater economy of heat. L. describes a furnace construction which combines a single-chamber kiln with a continuously operating furnace and is designed for those industries which require a single furnace for firing special products, while the chief product is fired in a continuous kiln. Illustrated. M.V.C.

Qualitative and quantitative analysis of hydrocarbon mixtures by means of their Raman spectra. D. H. RANK, R. W. SCOTT, AND M. R. FENSKE. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 816–19 (1942).—Illustrated. F.G.H.

Radiation configuration factors using light in furnace models. FRED ENGLAND AND H. O. CROFT. *Trans. Amer. Soc. Mech. Engrs.*, **64** [7] 691–702 (1942).—In problems involving the exchange of heat energy by radiation between bodies, it becomes necessary to know what areas of the bodies in question "see each other." Those factors expressing mutual visibilities are known as "configuration factors." Configuration factors have usually been determined either by mathematical analysis and computation or by actual experiment with bodies radiating heat energy. The authors introduce an experimental method of determining configuration factors by employing models of furnace cavities and utilizing the exchange of light energy instead of heat energy. Illustrated. F.G.H.

Radiation of furnace gases. H. C. HOTTEL AND R. B. EGBERT. *Trans. Amer. Soc. Mech. Engrs.*, **63** [4] 297–307 (1941).—Data of various investigators on the emission and absorption of radiation by carbon dioxide and water vapor are reviewed critically. Recommendations of procedure in the calculation of heat transmission by gas radiation are given for carbon dioxide and for water vapor. Partial pressure, P_w, of water vapor, at a constant value of P_wL, affects gas radiation but probably to a much smaller extent than has been reported in previous literature. A simplified procedure is presented to allow for the effect of the gas shape on radiant heat interchange. Illustrated. F.G.H.

Significance of coal-ash fusing temperature in the light of recent furnace studies. E. G. BAILEY AND F. G. ELY. *Trans. Amer. Soc. Mech. Engrs.*, **63** [6] 465–77 (1941).—The authors review recent data relating to the fusing temperature of coal ash as well as of ash and slag from pulverized-coal-fired furnaces of both slag-tap and dry-ash-removal types. The highly oxidizing conditions in parts of both types of furnaces and the effect upon the slag-and-ash formation raise questions regarding the greatest usefulness of the present A.S.T.M. standard fusing-temperature method on a reducing atmosphere alone. Previous work of the Bureau of Mines, showing that the form of the iron, whether ferrous or ferric, is of increasing importance with increased iron content, is confirmed. The appreciably higher percentage of iron in the furnace ash and slag over the iron content in the coal ash burned is shown. This increase applies to both dry-ash and slag-tap types of furnaces. More research is needed in both plant and laboratory. Illustrated. F.G.H.

BOOK

Industrial Furnaces: Vol. II. W. TRINKS. John Wiley & Sons, Inc., New York, 1942. 2d ed. 351 pp. Price $5.00. Reviewed in *Chem. & Eng. News*, **20** [18] 1200 (1942).—Although Vol. II is a continuation of Vol. I, it is complete in itself. Vol. I contains a great deal of theory and appeals mainly to the designer of furnaces, whereas Vol. II is devoted primarily to practice and should appeal to coordinators of existing designs. The subject matter is treated in six chapters: (1) fuels and sources of heat energy, (2) combustion devices and heating elements, (3) control of furnace temperature, (4) control of furnace atmosphere, (5) labor-saving appliances, and (6) critical comparison of fuels and furnace types. Probably no other book contains so much practical information essential to a comprehensive review of the different types of furnaces, burners, and heat-control equipment available for industrial heating with solid, liquid, or gaseous fuels or by electricity. Critical comments are made throughout the book on the suitability, advantages, and disadvantages for the purpose in hand of the fuels or types of equipment under discussion. Although much of the subject matter relates to metallurgical furnaces, especially those used in the steel, metal fabrication, and ceramic industries, this volume will be useful to any technologist confronted with the problem of selecting or designing a furnace for any special purpose. For Vol. I see *Ceram. Abs.*, **14** [2] 47 (1935). F.G.H.

Geology

Alkali feldspars of the ancient and recent intrusions of Kabardino-Balkarsk and some problems connected with them. S. P. SOLOV'EV. *Zapiski Vserossiĭskogo Mineral. Obshchestva*, **69** [2–3] 206–16 (1940); *Khim. Referat. Zhur.*, **4** [4] 38 (1941).—The alkali feldspar intrusions of this region, varying in the time and depth of their solidification, differ from each other optically. The feldspars of the earlier intrusions, solidified at a greater depth, have a very large $2V$ (often exceeding 80°), a clear triclinic character, and a clear microclinic lattice, i.e., they are microclines (microcline perthite). The feldspars of the recent porphyrylike granites have a moderate $2V$ (approximately 50°) and pseudomonoclinic optical orientation and belong to the potassium anorthoclases. The recent extruded rocks of the dellenite-liparite variety have a $2V$ approximately 30° and belong to sanidine or potassium anorthoclase. A chemical investigation of the feldspars indicates the predominance of the potassium molecule also in anorthoclases. X-ray diagrams show the similarity of their crystalline structure and very small differences in the intensity of the lines of a Debye diagram. M.Ho.

Aluminum deposits in Australia. ANON. *Queensland Govt. Mining Jour.*, **42**, 144 (1941); *Trans. Brit. Ceram. Soc.*, **41** [4] 51A (1942); see "Australian . . .," *Ceram. Abs.*, **21** [8] 176 (1942).

Barytes and witherite. F. B. MITCHELL. *Mine & Quarry Eng.*, **7**, 37 (1942); *Trans. Brit. Ceram. Soc.*, **41** [4] 51A (1942).—The occurrence of these minerals in Great Britain and their properties and uses are described.

Brazilian rutile goes to war. ANON. *Foote-Prints*, **15** [1] 3–8 (1942).—Rutile, a natural titanium dioxide, is used principally in welding rod coatings and in the manufacture of ferrotitanium. Since 1937, the demand has increased tenfold, and Brazil is becoming the leading producer. Rutile crystals are recovered by hand from alluvial deposits in the states of Goyaz and Ceará. A.P.

Cambrian clays of the Leningrad region and the possibilities of their industrial utilization. K. A. ALBOROV. *Sbornik Leningrad. Geol. Uprav.*, **1940**, No. 6, pp. 7–15; *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.Ho.

Cathode-luminescence method of analysis for minerals in field conditions. V. M. KUDRYAVTSEVA, G. S. OZHIGIN, AND N. L. GASTING. *Vestnik Zapad.-Sibirsk. Geol. Uprav.*, **1940**, No. 2, pp. 42–48; *Khim. Referat. Zhur.*, **4** [3] 65 (1941).—The difficulty of locating some industrial minerals is caused to some degree by the difficulty of their determination. This difficulty can be alleviated to a large extent by using luminescence analysis. The authors constructed a portable apparatus for field determinations which utilizes the bright luminescence of these minerals in slimes and works on the cathode-luminescence principle. As a source of high voltage, an induction coil of the Scintilla type is used. The pump is operated manually. The entire apparatus is enclosed in a 30- x 21- x 19-cm. box and weighs 8.5 kgm. In 1938 this apparatus was successfully used for locating deposits of scheelite. Minute grains of scheelite were detected by its bright blue luminescence. Grains and nodules could be detected even when covered with Cu and Fe oxides; in this condition they escape the usual methods of analysis. Powellite was detected by its bright straw-yellow luminescence. The apparatus can also be used for locating diamonds. Diagrams are included. M.Ho.

Colloid-mineralogical composition of the soil absorption complex. I. D. SEDLETSKIĬ. *Priroda*, **1940**, No. 7, pp. 17–27; *Khim. Referat. Zhur.*, **4** [4] 61 (1941). M.Ho.

Complex utilization of dunite. N. V. BUTYRIN. *Trudy Ural. Nauch. Konferentsiĭ, April, 1939, po Izucheniyu Proizvoditel'nykh Sil Akad. Nauk S.S.S.R.*, **1940**, pp. 133–38; *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.Ho.

Device for the rapid determination of the insoluble residue in a batch. A. G. ZHAVORONKOV. *Zavodskaya Lab.*, **9** [9] 1049–50 (1940); *Khim. Referat. Zhur.*, **4** [3] 66 (1941).—The apparatus consists of a cylindrical funnel provided with a stopcock, which fits into a filter pycnometer. The latter consists of a separatory funnel having a porous glass plate fused in the middle of it. The filter pycnometer is connected to a bell jar for filtration under suction. The weighed sample is placed in the funnel and dissolved in HCl. The water pump is started, and both stopcocks are open. The residue remains on the filter where it is washed with water. The stopcock of the pycnometer is closed, and the pycnometer is separated from the funnel and the bell, filled with water, and weighed. The amount of insoluble residue is calculated by the formula $x = \frac{d}{d-1}(m_2 - m_1)$, where d is the specific gravity of sand, m_2 is the weight of the insoluble residue and water, and m_1 is the weight of water filling the pycnometer (when there is no residue in it). M.Ho.

Drying suspended kaolin. B. KOZLOV. *Novosti Tekhniki*, **1940**, No. 19, pp. 33–34; *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.Ho.

Enrichment of quartz sand from the Chasov-Yar deposits. A. D. BARDENKO. *Stekolnaya Prom.*, **1940**, No. 9–10, pp. 5–8; *Khim. Referat. Zhur.*, **4** [4] 100 (1941). M.Ho.

Factors affecting the interaction between organic matter and montmorillonite. L. E. ENSMINGER. *Soil Science*, **54** [3] 191–97 (1942).—E. investigated the factors affecting the binding of organic matter by inorganic colloids, using a high montmorillonite Wyoming bentonite as the inorganic substance and wheat straw, alfalfa leaf meal, gelatin, albumen, and lignin as the inorganics. The combining capacity of gelatin increases with acidity. Composting increases the base-exchange capacity of straw and alfalfa leaf meal and increases their sorption by montmorillonite. Grinding increases the capacity of alfalfa leaf meal but has little effect on straw. Acidity increases the sorption of composted alfalfa leaf meal more than it does the original material. N.R.S.

First spodumene plant in North Carolina. ANON. *Bull. Amer. Ceram. Soc.*, **21** [12] 312 (1942).

Gravimetric method of sedimentation analysis. S. YA. STARODUBTSEV. *Zavodskaya Lab.*, **9** [7] 758–60 (1940); *Khim. Referat. Zhur.*, **4** [3] 65 (1941).—S. developed an apparatus for the analysis of dispersed systems; it consists of an analytical or technical balance with the pans removed. On one side of the beam is attached a spring, and

its other end is attached to a movable part of a gear rack; the other end of the gear rack is attached to the floor of the balance. On the same side of the beam is attached a contact which closes the circuit of an electric bell if the equilibrium of the balance is disturbed. On the other end of the beam is attached a rod terminating in a horizontal disk. The disk is placed in the cylinder containing the suspension. As the sediment settling on the disk disturbs the equilibrium of the balance, the spring is stretched for a definite distance and the circuit is closed, ringing the bell. The gear rack is adjusted to equilibrium, and the determination proceeds until the bell rings again. The time between two signals is measured with a stop watch. For analyzing suspensions of different viscosities and concentrations, springs with various degrees of sensitivity are used. This apparatus gave very good results. Curves for sedimentation analysis of a suspension of $BaSO_4$ are given as an example, and the procedure is outlined in detail. M.Ho.

Gravity vs. centrifuge separation of heavy minerals from sand. Gordon Rittenhouse and W. E. Bertholf, Jr. *Jour. Sed. Petrology*, **12** [2] 85–89 (1942).—The relative efficiencies of gravity and centrifuge separation were tested. The percentages of heavies by weight differ significantly; the number frequencies do not. Gravity separation tends to effect a cleaner separation of high specific gravity minerals than of low specific gravity minerals. Centrifuge separation is equally effective for all minerals. See "Centrifuge . . .," *Ceram. Abs.*, **20** [1] 22 (1941). G.M.H.

Identification of minerals by means of X rays. M. A. Peacock. *Trans. Roy. Soc. Canada*, **35**, Sect. IV, pp. 105–15 (1941). G.M.H.

Isocolloidal mixtures. M. N. Godlevskiĭ. *Zapiski Vserossiĭskogo Mineral. Obshchestva*, **69** [2–3] 221–27 (1940); *Khim. Referat. Zhur.*, **4** [5] 22 (1941).—G. understands isocolloidal mixtures to be solid colloidal systems made up of crystallites of separate components having colloidal dimensions. Isocolloidal mixtures are therefore solid colloidal solutions. When an isocolloidal mixture is formed from the salts Ax and By, the ratio of $A:x$ and $B:y$ is equal to the stoichiometric relation. An X-ray diagram shows the lines of both components, and a thermogram shows the characteristic stops of both components. Isocolloidal mixtures arranged according to the increase or decrease of any one of the components form an isocolloidal series. As an example of an isocolloidal series, G. cites ferrihalloysite-garnierite. Its composition may be expressed by the approximate formula $m(Al,Fe)_2O_3 \cdot 2SiO \cdot \cdot 2xH_2O + n(Ni,Mg)O \cdot SiO_2 \cdot xH_2O$. The minerals of this series are apparently formed by the coagulation of the corresponding sols. Under the microscope, the minerals appear as a uniform mass with a weak aggregate polarization. X-ray analysis gives the lines of both ferrihalloysite and garnierite. In the thermal analysis, all the stops characteristic for garnierite and for ferrihalloysite were found. M.Ho.

Kurnakovite, a new borate. M. N. Godlevskiĭ. *Compt. Rend. Acad. Sci. U.R.S.S.*, **28** [7] 639–41 (1940); *Khim. Referat. Zhur.*, **4** [4] 41 (1941).—G. describes a new borate corresponding to $2MgO \cdot 3B_2O_3 \cdot 13H_2O$ found among the borates of the Inder region. Kurnakovite was found in one of the deposits in the shape of lenses of irregular shape placed among asharite and also in the form of large grains having a glassy luster found on the walls of small caverns. The analysis gave the following results: MgO 15.46, B_2O_3 37.58, H_2O 47.09, CaO 0.16, R_2O_3 0.20, SiO_2 0.10, F 0.14, and insoluble residue 0.20%. It has a hardness of 3, and its specific gravity is 1.85. G. suggests that kurnakovite is a special phase of the system MgO–B_2O_3–H_2O and most likely was formed in a gypsum cap at the expense of Mg-containing borates. With the dilution of the solutions, it gradually transforms into asharite. M.Ho.

Laboratory study of London clay. L. F. Cooling and A. W. Skempton. *Jour. Inst. Civil Engrs.* [London], **17** [3] 251–76 (1942).—Physical tests were carried out on a large number of disturbed and undisturbed samples of London clay. Properties measured included (1) natural water content, (2) liquid limit, (3) plastic limit, (4) specific gravity of particles, (5) compressibility, (6) coefficient of consolidation, (7) shear strength under zero pressure and under 1 ton per sq. ft., and (8) unconfined compression strength. The properties varied one third as much over a distance of a few inches as over a distance of as many feet. The compressibility and shear strength were related to the liquidity index ((water content minus plastic limit) divided by (liquid limit minus plastic limit)) and the coefficient of consolidation to the liquid limit. Samples taken from other sites fell within the range of those examined from the main site, which was beneath the piers and abutments of the new Waterloo Bridge, London, 40 to 90 ft. above the bottom of the clay bed. See "Experiments . . .," *Ceram. Abs.*, **21** [6] 131 (1942). L.R.B.

Magnesite deposits at Princhester, Marlborough District, Queensland. J. E. Ridgway. *Queensland Govt. Mining Jour.*, **42**, 139 (1941); *Trans. Brit. Ceram. Soc.*, **41** [4] 51A (1942).—Magnesite occurs in the serpentine northwest and southwest and in the granite south of Marlborough; 500 tons have been mined from a small opencut $1\frac{3}{4}$ miles east of Mount Redcliffe. The magnesite (uncalcined) contains 46 to 48% MgO; it is nonferruginous and contains up to 25% SiO_2.

Magnesite in western Siberia. V. I. Derbikov. *Vestnik Zapad.-Sibirsk. Geol. Uprav.*, **1940**, No. 1, pp. 23–30; *Khim. Referat. Zhur.*, **4** [4] 40 (1941).—Deposits of magnesite were found in the region of the upper reaches of the Sungaya and Toguĭa rivers in the southern Salair. Viewed under the microscope, they appear as grains of carbonate coated with iron hydroxide films along the cracks. In the rocks are also encountered a little quartz, changed plagioclase, talc, serpophite, and evenly distributed grains of chromite, the latter being sometimes bordered by fuchsite. Chromite is also found among the grains of carbonate as well as in the plagioclase. The carbonate is represented by ferruginous magnesite-breinerite, $(Mg,Fe)CO_3$, containing approximately 6% of Fe. The rock contains breinerite 73.5, quartz 17.8, and other minerals 8.7%. D. considers the carbonate rock as a secondary formation which has undergone an enrichment of $MgCO_3$. This rock originated from an ultra-alkaline primary rock; this is attested by the even distribution of chromite grains and by the nature of other minerals present. The genesis of the magnesite or breinerite rock is considered metasomatic hydrothermal. M.Ho.

Methods of concentrating talc and problems of redesigning the Miass talc plant. G. V. Kazakov. *Prom. Stroitel. Materialov*, **1940**, No. 10–11, pp. 77–83; *Khim. Referat. Zhur.*, **4** [3] 89 (1941). M.Ho.

Mica substitute. D. T. Misharev. *Sovet. Geol.*, **1940**, No. 9, pp. 120–21; *Khim. Referat. Zhur.*, **4** [3] 85 (1941).—M. describes a method for making alsifilm from bentonitic clay. The electrotechnical properties of this material are very similar to those of natural mica. M.Ho.

New method for the investigation of clays and the preparation of clay solutions. V. L. Kvirikashvili and A. I. Tsurinov. *Rabochiĭ Neft*, **1940**, No. 9, pp. 5–6; *Khim. Referat. Zhur.*, **4** [4] 101 (1941).—Thixotropy is an important property of clay suspensions. Because of it, the clay retains the drilled rock in a suspended state. A new method for the preparation of clay suspensions consists in mixing the clay with 20 to 50% of its weight of water and blunging it until it forms a thick paste. The amount of water depends on the colloidality of the clay. The clay paste is further mixed for 10 to 15 min., and water is then added to establish the right viscosity. M.Ho.

New uses for vermiculite. Anon. *Bull. Amer. Ceram. Soc.*, **21** [11] 302 (1942).

Science and the land. F. L. Engledow. *Chem. & Ind.*, **61** [22] 239–45 (1942).—E. presents a general discussion of soil science. The soil topics of interest include physical properties, chemical characteristics, and organic relationships relative to plant and animal life. R.H.B.

Selection of clay for insulating brick. Anon. *Ceram. Age*, **36** [6] 169–70 (1940).—Fundamental principles of clay selection are briefly reviewed. F.G.H.

Thixotropic solidification of clays. A. I. AVGUSTINNIK. *Sbornik Trudov Leningrad. Tekh. Inst. VSPK*, **1940**, No. 3, pp. 51–70; *Khim. Referat. Zhur.*, **4** [4] 101 (1941). M.Ho.

Turkish chrome. ANON. *Chem. Age* [London], **47** [1212] 266 (1942).—Negotiations are in progress between the British and Turkish Governments for a renewal of an agreement concerning the purchase of chrome from Turkey. The agreement in force at present expires in January, 1943, having been in operation for three years. By this agreement Britain had the first claim on practically the entire production of Turkish chrome. The Turkish Government has promised to supply Germany with chrome only on the following conditions: Between Jan. 15 and March 31, 1943, Turkey and Germany would exchange products to the value of £T 55,000,000, Germany to deliver goods consisting partly of war material and partly of commercial supplies, while Turkey would deliver 45,000 tons of chrome and the remainder in other products. From March 31 to the end of 1943, Turkey would deliver another 45,000 tons of chrome and in 1944, 90,000 tons more, all of which would be exchanged for German war material. A uniform condition was that Turkish goods should be delivered only after the arrival of German articles to the same value on Turkish territory. The capacity of the Germans to deliver large quantities of war material being very doubtful, they have been endeavoring to persuade the Turkish Government to let them have immediate supplies of chrome against credits, spare-part deliveries, etc. Turkey, however, has consistently refused. See *Ceram. Abs.*, **21** [4] 90 (1942). A.B.S.

SEPARATE PUBLICATION

Kaolin Deposits of Southern Pike County, Arkansas. PAUL G. HEROLD AND GEORGE R. HEYL. *Bull. Arkansas Geol. Survey*, No. 7, 38 pp. (1942). Price 30¢.—Chalky white to cream-colored kaolin is found in the Tokio formation (Upper Cretaceous) in the hilly, wooded region between Murfreesboro and Delight, Pike County, Ark. The kaolin occurs as horizontal beds which range up to 5 ft. in thickness. In places these deposits have been prospected, and from one of these pits a sample of kaolin was obtained. The sample was subjected to physical and ceramic tests which indicate that the clay is suitable for the manufacture of vitreous whiteware, particularly in those cases in which white color, minimum warpage, and considerable dry strength are the important factors.

PATENT

Manufacturing highly active depolarizer from natural pyrolusite. CARLO ROSSETTI (Leclanché S. A.). U. S. 2,299,428, Oct. 20, 1942 (June 18, 1938).—A method of manufacturing manganese dioxide of high depolarizing capacity comprising roasting natural pyrolusite in the presence of carbon to reduce it into a mixture of lower oxides which has less content of oxygen than Mn_2O_3, suspending the reduced mass in a neutral aqueous solution of manganous sulfate, directly submitting the aqueous suspension so obtained to electrolysis until permanent acid reaction appears, thereby forming on the one hand a depolarizing precipitate composed essentially of MnO_2 whereof a part is freshly precipitated MnO_2 in a highly active state and the other part is original MnO_2, the surface area of which is increased by freeing it from its content of lower oxides, and on the other hand regenerating the manganous sulfate solution used, and finally filtering the depolarizing precipitate from the remaining solution of manganous sulfate.

Chemistry and Physics

Adaptation of an indirect method for potassium to the photoelectric colorimeter. C. P. SIDERIS. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 821–22 (1942).—The determination of potassium as potassium sodium cobaltinitrite with nitroso R salt (disodium salt of 1-nitroso-2-hydroxy-3,6-naphthalenedisulfonic acid) can be made with much greater precision by using a photoelectric colorimeter with appropriate light filters instead of an optical colorimeter. The range of concentrations best suited is from 0.5 to 15 μgm. Illustrated. F.G.H.

Analytical use of sodium rhodizonate. FRITZ FEIGL AND HANS A. SUTER. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 840–42 (1942).—The authors briefly describe the use of sodium rhodizonate for spot-test analysis. This reagent can now be recommended for the detection of (1) barium, (2) strontium, (3) barium in the presence of strontium, (4) strontium in the presence of barium, (5) sulfate, (6) barium and strontium in the carbonate precipitate of the alkaline-earth metals, (7) lead in dilute solutions, (8) lead in the presence of ions that otherwise interfere, (9) lead in ores and minerals, (10) lead in alloys, and (11) lead in pigments, glass, etc. F.G.H.

Behavior of zinc ion in the separation of sesquioxides with barium carbonate. N. I. P'YANOVA. *Uchenye Zapiski Kazan. Gosudarst. Univ.*, **100** (Book 1) [3] 31–42 (1940); *Khim. Referat. Zhur.*, **4** [3] 51 (1941).—P. investigated the reaction between $ZnCl_2$ and $BaCO_3$ to determine the possibility of using $BaCO_3$ for separating sesquioxides from monoxides. An excess of $BaCO_3$ precipitates Zn^{++} as $ZnCO_3$. In separating the sesquioxides, therefore, it should be taken into account that the precipitate will contain Zn besides Al, Fe, and Cr. M.Ho.

Colloid chemical factors in filtration. S. E. KHARIN, G. M. POPOVA, AND M. V. AZHORSKAYA. *Kolloid. Zhur.*, **6** [5] 425–35 (1940); *Khim. Referat. Zhur.*, **4** [4] 23–24 (1941).—The authors studied the rate of flow of HCl, KCl, $CaCl_2$, and $FeCl_3$ in concentrations ranging from 10^{-5} to 10^{-2} *N* through filters of sand, asbestos, chalk, and kieselguhr. The rate of flow decreases with an increase of the ζ potential. In the case of colloidal solutions, the determining factor of the rate of flow is the colloid content in the filtered liquid. Experimentation with many colloidal solutions showed that the rate of flow decreased with an increased content of colloids in the solution. Reasons for the observed phenomena are the contamination of the filter by large particles, the adsorption of finely dispersed particles in the pores, and the change in the surface tension and the ζ potential of the membrane under the influence of molecularly dissolved substances. M.Ho.

Colorimetric determination of aluminum, tin, molybdenum, and chromium by the hematoxylin method. V. YA. TARTAKOVSKIĬ. *Zavodskaya Lab.*, **9** [9] 971–75 (1940); *Khim. Referat. Zhur.*, **4** [3] 52 (1941).—T. investigated the conditions of formation of the hematoxylin complex. He worked out a method for determining Al in alkali hydroxides with the aid of hematoxylin. This method is more sensitive and accurate than the alizarin method. The interfering Fe is removed by extraction with amyl alcohol as $Fe(CNS)_3$ or by introducing similar amounts of Fe in the standard samples used for color comparison. Hematoxylin reacts with many metals of the fourth and fifth group. Methods are given for determining Cr, Sn, and Mo in the presence of small amounts of Al and Fe. They are based on the greater resistance toward acid of the Cr, Sn, and Mo hematoxylin complexes than of the Al and Fe complexes. M.Ho.

Colorimetric microdetermination of iron. C. P. SIDERIS. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 756–58 (1942).—Ferrous iron forms with nitroso R salt (1-nitroso-2-hydroxy-3,6-naphthalene disodium sulfonate), at a favorable range of pH values (8 to 10), a green pigment which is in direct proportion to the amounts of ferrous iron present in the solution. The sensitivity of the reagent is very great, reaching the low limits of 0.2 μgm. of ferrous iron per ml. and ranging between 0.2 and 50 μgm. or more. S. found hydroxylamine sulfate highly satisfactory for the reduction of ferric iron to ferrous iron and sodium acetate or ammonium hydroxide for obtaining a satisfactory pH range for the development of the green pigment. Iron

may be determined by means of a photoelectric colorimeter with the use of appropriate light filters. Illustrated. F.G.H.

Constitution of sodium silicate solutions. R. C. Ray, P. B. Ganguly, and A. B. Lal. *Trans. Faraday Soc.*, **37** [2–3] 104 (1941).—The constitution of sodium silicate solutions was investigated by the diffusion method. The bottoms of tubes were covered to a height of 10 cm. with the silicate solution. A layer of water was placed on the top, and diffusion was allowed to continue for a definite period. Samples were drawn off at various heights and analyzed for $Na_2O:SiO_2$. The molar ratio $Na_2O:SiO_2$ in the top layers tended to the same value in all cases, viz., 1:0.5. Sodium silicate solutions should consist of $2Na_2O:SiO_2$ or Na_4SiO_4 mixed with varying amounts of colloidal silica. The 1:1-ratio silicate can be considered to be the dihydrogen form of the above compound, viz., $Na_2H_2SiO_4$. Definite proof of the existence of Na_4SiO_4 in solution is still required. F.J.H.

Determination of cadmium and mercury with pyridine. I. P. Ryazanov and M. V. Pyshcheva. *Uchenye Zapiski Saratov. Gosudarst. Univ.*, **15** [4] 128–33 (1940); *Khim. Referat. Zhur.*, **4** [3] 52 (1941).—The authors investigated the precipitation of Cd and Hg as pyridine complexes. To transform the precipitate into such state that it could be weighed, the following methods were tried: (1) that of Dick, consisting in washing the precipitate with alcohol and ether, and (2) that of drying the precipitate *in vacuo*. The Cd was precipitated as $[CdPy_2](SCN)_2$. The Cd found deviated from the amounts taken by 0.09 to 0.35%. The Hg was precipitated according to Spac as $[HgPy_2]Cr_2O_7$ and according to Lang as $HgCl_2Py$. The deviations by the first method were 0.05 to 0.2% and by the second method 0.02 to 0.10%. To separate Cd and Hg, the latter is precipitated by the Lang method as $HgCl_2Py$. In the filtrate the Cd is precipitated by the Spac method as $[CdPy_2](SCN)_2$. In such determinations, the deviations for Hg were 0.05 to 1.50% and for Cd 0.04 to 1.83%. M.Ho.

Determination of cobalt and manganese by photometric methods. Louis Waldbauer and Nell M. Ward. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 727–28 (1942).—Cobalt can be determined in the presence of manganese when the latter is present up to as high as 99.40% by means of the chloroform extract of the cobaltinitroso-beta-naphthol compound in the photelometer, using a green filter. Manganese can be determined by separation as the manganese ammonium phosphate with subsequent conversion to the manganese formaldoxime compound and then determined in the photelometer without a filter. The method is satisfactory even when the cobalt is present in amounts as high as 99.50% in the original sample. Illustrated. F.G.H.

Determination of germanium in silicate rocks. Anna-Greta Hybbinette and E. B. Sandell. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 715–16 (1942).—This method for the determination of germanium in silicate rocks and the rock-forming silicates involves decomposition of the sample with sulfuric-nitric-hydrofluoric acid, isolation of germanium by distillation of the tetrachloride, and its colorimetric estimation in the distillate with ferrous sulfate-ammonium molybdate. F.G.H.

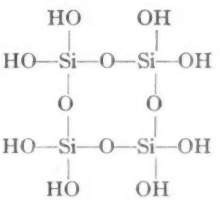
Determination of oxide copper. R. S. Young and D. G. M. Graham. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 787–88 (1942).—The use of 3% sulfur dioxide as a solvent for oxide copper, recommended by standard analytical textbooks, has been found unsatisfactory, but the substitution of 5% sulfuric acid saturated with sulfur dioxide has resulted under the same conditions in complete recovery of oxidized copper, except cuprite. In the absence of ferric sulfate, solution of copper sulfides is negligible. Contrary to the references cited, cuprite cannot be determined by the sulfurous acid method for oxide copper or even by employing 5% sulfuric acid saturated with sulfur dioxide. The presence of iron as sulfide or oxide does not lead to attack of copper sulfide, using 5% sulfuric acid saturated with sulfur dioxide. If ferric sulfate is initially present, appreciable solution of copper sulfide occurs during the leaching period in spite of the presence of sulfur dioxide, and results for oxide copper are not reliable. F.G.H.

Displacement of zinc and cadmium from their sulfides with copper sulfate. V. A. Podgorbunskiĭ. *Sbornik Trudov Irkutsk. Gorno-Metallurg. Inst.*, **1940**, No. 2, pp. 65–69; *Khim. Referat. Zhur.*, **4** [3] 52 (1941).—ZnS and CdS, precipitated as usual, are filtered and washed. The filtrate is heated in a solution of $CuSO_4 \cdot 5H_2O$ taken fourfold. The excess Cu is determined iodometrically. From the amount of Cu spent, Cd or Zn is determined. This reaction between $CuSO_4$ and ZnS or CdS is quantitative. M.Ho.

8-Hydroxyquinoline as a reagent for the determination of magnesium, especially in carbonate and silicate rocks. C. C. Miller and I. C. McLennan. *Jour. Chem. Soc.* [London], **1940**, p. 656.—Magnesium can be precipitated with oxine (1) by adding the oxine to an ammoniacal solution containing NH_4Cl or (2) by adding ammonia to an acid solution containing the oxine. The former method yields the purer product. The standard method for determining magnesium in solutions free from foreign salts except NH_4Cl has been modified for solutions containing ammonium oxalate and other salts such as are obtained in rock analysis after removing SiO_2, ammonia precipitate, and calcium as oxalate. This method is suitable for technical analysis but not for accurate work. R.A.G.

Equilibrium of the system NH_4F–AlF_3–H_2O at 25°. A. V. Novoselova. *Zhur. Obshcheĭ Khim.*, **10** [17] 1547–50 (1940); *Khim. Referat. Zhur.*, **4** [4] 34 (1941).—N. studied the composition and the conditions required for the formation of a compound of aluminum fluorite and ammonium fluorite. The solubility isotherm of the system NH_4F–AlF_3–H_2O was determined at 25°; it consists of 4 branches. Double fluorites of aluminum and ammonium dissolve in water incongruently. M.Ho.

Heat of coagulation of silica and its bearing on the structure of silica gels. A. Riad Tourky. *Chem. & Ind.*, **61** [23] 254–55 (1942).—Two theories have been postulated to account for the structure of silicic acid hydrogels: (1) A gel consists of highly hydrous silicon dioxide particles enmeshed in a structure which entrains all the liquid phases. (2) The silica gel consists of a network of large polysilicic acid molecules which can be represented by



T. contends that the differences between the two theories are not distinct; the difference between the two structures can be considered as being one of degree and not of type. The extent to which the primary particles might be grown up before they coalesce into secondary aggregates might vary from one case to the other. Experiments on the heat of coagulation of sodium metasilicate solutions substantiate T.'s premise. R.H.B.

Method for eliminating errors in gravimetric analysis. A. B. Shakhkeldian. *Uchenye Zapiski Saratov. Gosudarst. Univ.*, **15** [4] 70–75 (1940); *Khim. Referat. Zhur.*, **4** [3] 48 (1941).—The precipitation of Fe in the presence of B gives too high results because of the occlusion of B by $Fe(OH)_3$. To eliminate this error, S. suggests making the determination twice, once with the analyzed solution containing an unknown quantity (x) of the substance to be determined, and the second time with the same volume of the analyzed solution to which has been added a known amount of the substance sought (c). The total amount of the unknown in the second determination is $x + c$. The calculation is made as follows: $\frac{x+a}{x} = \frac{A}{a}$, where a is the result of the first determination, and A is the result of the

second determination. S. points out that by this method the same error appears in both the numerator and the denominator. By precipitating Fe in the presence of B (not more than 2 gm. of H_3BO_3 per 100 ml. of the solution) by the usual method, the errors are between +4.0 and +5.2%; the errors by the recommended method are between −0.5 and +0.2%. The use of this method for decreasing errors in gravimetric analyses is discussed. M.Ho.

Migration in crystal lattices. R. M. Barrer. *Trans. Faraday Soc.*, **37** [11] 590–99 (1941).—Diffusion in solids is amenable to treatments developed originally for reaction kinetics. In the latter field two approaches have been made: (1) the kinetic theory method and (2) the transition state method. The treatment given couples the kinetic method with the statistical theory of disorder in crystal lattices. Diffusion may proceed by simple place exchange. Adjacent atoms may pass by one another if neighboring atoms move aside simultaneously. The diffusion by place exchange requires a local zone of disturbance in the lattice. Crystal analysis indicates that certain aluminosilicates (zeolites, ultramarine, etc.) have channels in the lattice which are sufficiently wide for ions or neutral molecules to diffuse through the structure. Diffusion processes of this kind are termed zeolitic. Equations are given for the diffusion constant according to the four mechanisms of migration in solid lattices: zeolitic diffusion, migration of Schottky defects, migration of Frenkel defects, and place-exchange diffusion. The range of theoretical values of the term D_o in the equation $D = D_o e^{-E/RT}$ is discussed for the four mechanisms. In zeolitic solution the terms D and D_o diminish toward zero at saturation. The value of E need be little affected. F.J.H.

New method for the analysis of chromite. Z. V. Ogur. *Byull. Khim. Obshchestva im. Mendeleeva*, **1940**, No. 10, p. 19; *Khim. Referat. Zhur.*, **4** [4] 76 (1941). M.Ho.

Phosphate colorimetric method for determining bismuth. M. I. Tarasenko and V. I. Petrashen. *Izvest. Novocherkassk. Ind. Inst.*, **6** [20] 69–74 (1940); *Khim. Referat. Zhur.*, **4** [3] 54 (1941).—The authors suggest a phosphate colorimetric method for determining Bi based on the method of Devizhe. The Bi is precipitated as phosphate. The precipitate is filtered, carefully washed, and dissolved in HCl. The P_2O_5 in the solution is determined colorimetrically. From the amount of P_2O_5 present, the amount of Bi_2O_3 connected with it is calculated. M.Ho.

Photocolorimetric method for determining fluorine. A. B. Shakhkeldian and E. Serdobova. *Uchenye Zapiski Saratov. Gosudarst. Univ.*, **15** [4] 87–93 (1940); *Khim. Referat. Zhur.*, **4** [3] 50 (1941).—The determination of F by the Foster method, using a photocolorimeter, was investigated. The Foster method is based on the bleaching effect of F^- on iron thiocyanate. The photocolorimeter used was equipped with one Se photocell. A smooth curve was obtained using a blue filter (its characteristics are not indicated). The error of the determination is −1.9 to +1.3%. M.Ho.

Photoelectric method for determining silica in metallic magnesium. A. L. Davydov and O. A. Malinovskaya. *Zavodskaya Lab.*, **9** [9] 964–67 (1940); *Khim. Referat. Zhur.*, **4** [3] 54 (1941).—Decompose a 0.5-gm. sample in a porcelain dish with 45 ml. H_2SO_4 (1:30) saturated with Br and heat on a water bath for 15 min. Transfer into a 50-cc. measuring flask filled to mark and mix thoroughly. Transfer 10 ml. with a pipette into another 50-cc. measuring flask. Add 5 ml. H_2O, 1 ml. of 5% $(NH_4)_2MoO_4$, keep for 5 min., and then add 10 ml. of 8 N H_2SO_4 and 1 ml. of a 0.5% solution of $SnCl_2$. Fill to mark, mix thoroughly, and determine colorimetrically, using a photocolorimeter of the Davydov type. The Si concentration is read from a calibration curve. The time of the determination is 30 min., and its accuracy is 0.001 to 0.005% at a Si content of 0.015 to 0.05%. M.Ho.

Physicochemical principles of vanadatometry. V. S. Syrokomskiĭ and L. I. Antropov. *Zavodskaya Lab.*, **9** [8] 818–24 (1940); *Khim. Referat. Zhur.*, **4** [3] 47 (1941).—The authors determined the oxidation-reduction potential of the system V^{+++++}/V^{++++} and its dependence on the acidity of the medium. The average normal potential in a 1 N H_2SO_4 as obtained by three methods was 1.006 v. The relation between the potential and the concentration of H_2SO_4 can be represented by the formula $E = 0.965 + 0.0173\ N$, where E is the potential and N is the normality of H_2SO_4. This formula is valid for concentrations of H_2SO_4 between 1 and 27 N. The accuracy of potentiometric titration with vanadate is independent of the acidity of the solution. Because of the large changes in the potential, V^{+++++} is a good oxidizer for potentiometric titration. Vanadatometric titration with phenylanthranylic acid gives good results at an acidity of 4 to 13.5 N. The potential of the change of phenylanthranylic acid is independent of the acidity of the medium. M.Ho.

Precipitation of aluminum with cupferron. V. M. Zvenigorodskaya and Yu. A. Chernikhov. *Zavodskaya Lab.*, **9** [10] 1089–90 (1940); *Khim. Referat. Zhur.*, **4** [4] 72–73 (1941).—Ta, Cb, Zr, Ti, Fe, and V are first precipitated in an acid medium with cupferron. The acid filtrate is carefully neutralized with ammonia and cooled. To the cooled neutral solution is added 20 ml. of an acetate buffer made up of 7 gm. CH_3COONH_4 and 2 ml. of CH_3COOH per 100 ml. In the resulting solution having a pH of 4 to 5, cupferron-aluminum complex is precipitated. The precipitate is filtered off and washed with cold 0.1% cupferron slightly acidified with CH_3COOH. The precipitate is ashed and ignited, the temperature being gradually increased to 1100°. This method was tried on pure salts and on various substances containing Al and proved satisfactory. M.Ho.

Production and utilization of solutions of alkali silicates with a high modulus. P. Pshenitsyn and S. Lavrovich. *Kolloid. Zhur.*, **6** [5] 459–70 (1940); *Khim. Referat. Zhur.*, **4** [4] 100 (1941).—High-modulus alkali silicates are obtained by electrolysis, using an upper mercury cathode. Concentrated solutions of alkali silicates are only slightly stable and should therefore be used shortly after they are prepared. Solutions containing alkali silicates are solidified by the transformation of SiO_2 from a dissolved state into a gel, thereby bonding the grains of any filler it may contain. The alkali particles in the micelles formed by the gel apparently occupy "knot" positions. Any disturbances in the requirements for the formation of the SiO_2 gel result in incomplete formation and at times in complete absence of a structural aggregate. M.Ho.

Properties of ions: IV, Ionic radii and exchange reactions of alkali halides. B. V. Nekrasov and D. A. Bochvar. *Zhur. Obshcheĭ Khim.*, **10** [13] 1218–19 (1940); *Khim. Referat. Zhur.*, **4** [4] 11 (1941).—The process of the exchange decomposition of binary salts in solutions is discussed. As a first approximation the authors compute the coulomb forces involved. The ionic radii are taken as parameters determining the direction of the reaction. The authors show that exchange reactions in fused alkali halides give rise to salts formed from ions having the smallest radii on the one hand and salts made of ions with the largest radii on the other. **V, Simplest formula for computing the energy of crystalline lattices.** B. V. Nekrasov. *Zhur. Obshcheĭ Khim.*, **10** [15] 1393–94 (1940); *Khim. Referat. Zhur.*, **4** [4] 11–12 (1941).—N. transforms the A. F. Kapustinskiĭ equation ("Theory . . .," *Ceram. Abs.*, **15** [6] 192 (1936)) for the energy of a crystalline lattice so that it gives the energy per gram-equivalent of the substance. The equation reads:

$$U = 256\,\frac{V_c + V_a}{r_c + r_a}\ \text{cal./gm.-equiv.},$$

where V_c and V_a are the valences of the cation and anion, respectively, and r_c and r_a are the respective radii according to Goldschmidt. M.Ho.

Qualitative analysis of microgram samples. General technique and confirmatory tests. A. A. Benedetti-Pichler and Michael Cefola. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 813–16 (1942).—The technique of working in the capillary cone has been extended to permit the performance of confirmatory tests after the separation of

constituents. The tests are carried out on a circular plateau 0.03 to 0.2 sq. mm. in area obtained by cutting a glass thread 0.2 to 0.5 mm. in diameter. The thread is drawn out from the end of a short glass rod of 5-mm. diameter, which serves at the same time as condenser for concentration of the light in the plateau. The identification of approximately 0.001 μgm. of the more common ions of the hydrogen sulfide group is assured in this manner. The cell for the performance of the operations has been modified to accommodate a greater variety of tools, and better control of the operation of the micropipette has been obtained with the use of a plunger advanced by means of a screw with a fine thread. Illustrated. F.G.H.

Rapid X-ray diffraction method. A. T. McCord. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 793–96 (1942).—A technique is described whereby powder samples for X-ray diffraction work may be rapidly prepared. The sample is formed into a rigid rod 3 mm. in diameter and is inserted in the camera to form one side of the defining slit. Under average conditions, patterns are obtained which are sufficiently clear for the identification of crystalline powders, irrespective of their coefficients of absorption. An optimum set of conditions may be defined for any mixture of two or more substances, so that analyses may be made with improved accuracy. Illustrated. F.G.H.

Reduction of trivalent arsenic on a dropping mercury electrode. T. A. Kryukova. *Zavodskaya Lab.*, **9** [9] 950–57 (1940); *Khim. Referat. Zhur.*, **4** [3] 49–50 (1941).—Trivalent As can be reduced on a dropping Hg electrode only in an acid medium. For best results the solution is neutralized and then slightly acidified with tartaric acid; to it is added neutral potassium tartrate. M.Ho.

Reversible aggregations of colloidal particles. Wilfred Heller. *Jour. Phys. Chem.*, **45,** 1203 (1941).—When a thixotropic gel is centrifuged, it separates into an upper dilute sol phase and a lower concentrated phase which is a thixotropic gel. H. studied the kinetics of this separation with particular reference to thixotropic iron oxide sols. R.A.G.

Review of works of Soviet authors on quantitative microanalysis. I. M. Korenman. *Zavodskaya Lab.*, **9** [10] 1185–86 (1940); *Khim. Referat. Zhur.*, **4** [3] 47 (1941). M.Ho.

Role of magnesia in ceramic masses. F. Lipinski. *Angew. Chem.*, **54** [21–22] 265 (1941).—The fluxing effect, i.e., the influence on the melting point, of the addition of magnesia or magnesia compounds is discussed. Three cases are distinguished: (1) the effect of MgO or $MgCO_3$ on kaolin or clay, (2) the effect of soapstone or talc, and (3) the effect of MgO in special refractory masses (chrome-magnesia brick). In the first case, the melting point of kaolin is decreased with increasing additions of magnesite up to 30% MgO; with further additions, the melting point increases again up to that of pure magnesia. The conditions are similar if MgO is introduced in the form of soapstone. The melting point of kaolin decreases with increasing soapstone additions to 1280°C. with a content of 70% soapstone and increases with further additions, i.e., in the range of steatite products, up to 1500°C., the melting point of soapstone. The sintering temperature is also reduced, but the interval between these two points decreases at first with increasing MgO content and widens again with further additions. The melting point of chrome-magnesia brick is not lowered, but compressive refractory strength is improved by the addition of magnesia. Magnesia exerts therefore an actual fluxing effect only in silicic oxide-rich masses. A similar effect is found when other fluxes, such as lime and alkalis, are present at the same time. Masses containing MgO show a more or less strong densification and high mechanical strength between 1200° and 1400°C., the densification being ascribed to the formation of the eutectic melt with 20.3 MgO, 18.3 Al_2O_3, and 61.4% SiO_2. As MgO possesses a strong reactivity at higher temperatures, Mg silicates ($MgSiO_3$, $MgSiO_4$) and Mg aluminate ($MgO \cdot Al_2O_3$) are formed far below their melting temperature. Magnesia, however, not only affects the behavior at firing but also affects the properties of the fired masses, such as thermal expansion, mechanical strength, resistance to thermal shock, and swelling, all of which are mostly improved. M.Ha.

Silicic acid gels: XIII, Examples of regelation. Charles B. Hurd and Louis W. Thompson. *Jour. Phys. Chem.*, **45,** 1263–67 (1941).—Silicic acid gels (3 to 5% silica), after setting, were beaten into fine particles with an equal volume of distilled water. The settled material showed a type of regelation. Acidic mixtures (pH 5.1) reset eight times, but mixtures more basic than pH 10.5 did not reset at all. The gels did not show true thixotropy. The fineness of division is probably important, and experiments should be carried out in a colloid mill. For Part **XI** see *Ceram. Abs.*, **21** [3] 71 (1942). R.A.G.

Solubility of strontium chromate and the detection of strontium. T. W. Davis. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 709–11 (1942).—The solubility of strontium chromate in alcoholic solutions as well as in water solutions is found to diminish somewhat in the temperature range 25° to 75°C. As the removal of strontium as chromate will be more complete at the higher temperatures, a modification of the classical A. A. Noyes procedure for the qualitative analysis of the alkaline-earth group is suggested, providing for precipitation and filtration of strontium chromate from hot solutions. The new procedure effects a considerable saving in time. Solid strontium chromate in contact with aqueous solutions undergoes a very slow hydration which has not been mentioned previously in the literature. The hydration at 25°, like the formation of a saturated solution at the same temperature, would probably not be complete in less than several years' time. F.G.H.

Tabulated diffraction data for cubic isomorphs. Ludo K. Frevel. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 687–93 (1942).—Chemical analysis by the Debye-Scherrer-Hull method consists in matching the diffraction pattern of an unknown material with one or more standard powder patterns. In applying this empirical method to a large number of actual analyses, cases are encountered where the patterns sought are not found in a collection of 1000 to 2000 catalogued patterns. In those instances, the matching method can be augmented by systematically comparing the diffraction pattern of an unidentified phase with representative patterns of the various known crystal structures in an attempt to establish isomorphism between the unknown phase and one of the standard structures. This comparison method is readily applicable in the case of cubic substances, as their diffraction patterns are recognized by the absence of "splitting" of lines, i.e., in the isotropic system the interplanar distance d_{hkl} is independent of the sign and order of the indices h, k, and l. The procedure for comparing the diffraction patterns of isomorphous substances has been described previously ("Indexing . . .," *Ceram. Abs.*, **21** [6] 132 (1942)); hence only the tabulated diffraction data for cubic isomorphs are presented here. The identification of crystalline solids by the method of isomorphous comparison depends for its utility on the availability of systematically arranged diffraction patterns of the various known crystal structures. The cubic structures were considered first, in view of the simplicity with which cubic patterns can be identified and indexed. (Data on the tetragonal structures and hexagonal structures are being classified to extend the usefulness of the method.) While the primary application of isomorphous comparison is the identification of compounds by diffraction methods, the tabulated patterns can be used to check questionable reflections of a published powder pattern. In general, the tabulated data should prove useful to an analyst in pointing out possible ambiguities of a chemical analysis by diffraction methods. In a case of that type, some simple physical or chemical test will usually suffice to resolve the difficulty. Spectroscopic analysis should always supplement any chemical analysis by the powder method. The crystal structure investigator may find the classified diffraction patterns helpful in checking trial structures or in establishing some structural similarity between a known structure and a new structure. Illustrated. F.G.H.

Use of the reaction of copper oxide and nitrite ion in quantitative analysis. E. V. PERVUSHIN. *Izvest. Novocherkassk. Ind. Inst.*, **6** [20] 65–68 (1940); *Khim. Referat. Zhur.*, **4** [3] 49 (1941). M.Ho.

Volumetric determination of iron and titanium. WALLACE M. MCNABB AND HERMAN SKOLNIK. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 711–13 (1942).—The volumetric estimation of iron and titanium generally used in the titanium pigment industry involves reduction of the solution (zinc-amalgam reductor), titration of the combined iron and titanium with standardized potassium permanganate, and separate titration of titanium with standardized ferric ammonium sulfate. The method described has the advantage of requiring the use of only one standardized solution. F.G.H.

Volumetric determination of sulfates. Tetrahydroxyquinone as an external indicator. S. W. LEE, J. H. WALLACE, JR., W. C. HAND, AND N. B. HANNAY. *Ind. Eng. Chem., Anal. Ed.*, **14** [10] 839–40 (1942).—A method of using tetrahydroxyquinone as an outside indicator in the determination of sulfate is described; it can be conveniently and rapidly used with considerable accuracy. It offers a means of removing interfering substances such as aluminum ion and a large excess of sodium chloride. The possibility of using a spectrophotometer in confirming the end point in this titration is pointed out. Illustrated. F.G.H.

Volumetric estimation of small quantities of barium and sulfate with barium rhodizonate as indicator; determination of sulfur in iron pyrites. C. C. MILLER. *Jour. Chem. Soc.* [London], **1940**, p. 401.—The indicator is used in the volumetric titration of barium by means of sulfate. The accuracy is 1% for 4 to 20 mgm. of sulfate. Al, ferrous iron, and many other cations do not interfere, but phosphate causes a positive error of 2%. R.A.G.

Volumetric method for determining tin based on the formation of a dioxalatothiometastannate. HOBART H. WILLARD AND TAFT Y. TORIBARA. *Ind. Eng. Chem., Anal. Ed.*, **14** [9] 716–18 (1942).—A solution of stannic tin is converted to potassium oxalatostannate, $K_6Sn_2(C_2O_4)_7$, by adding potassium oxalate to a definite pH (a range of 2.2 to 2.8 is satisfactory if potassium sulfide is subsequently used, or approximately 3.3 in case hydrogen sulfide gas is used). The salt is then converted to dipotassium dioxalatothiometastannate, $K_2SnS(C_2O_4)_2$, by the addition of potassium sulfide or hydrogen sulfide. The excess of hydrogen sulfide is removed by a current of carbon dioxide, and the sulfur in the complex is titrated by standard iodine. In the presence of considerable amounts of other metals, the tin is first separated as metastannic acid. An inert atmosphere is required only to remove the excess of hydrogen sulfide. F.G.H.

Yellow fluorescent form of zinc silicate. H. P. ROOKSBY AND A. H. MCKEAG. *Trans. Faraday Soc.*, **37** [6] 308 (1941).—The work of G. R. Fonda and of Schleede and Gruhl on the constitution of yellow fluorescent zinc silicate is discussed. The work is based on the X-ray examination of material obtained by heat-treatment of zinc oxide-silica mixtures. A mixture of 2 mol. of ZnO and 1 mol. of SiO_2 with 1% manganese, prepared at 1500°C. and quenched, gave a product whose fluorescence was uniformly yellow. Another mixture contained 1 mol. of ZnO and 1 mol. of SiO_2 with 0.5% manganese. This was heated at 850°C. for 3 hr., giving a yellow fluorescent product. X-ray diffraction photographs clearly show that both products are crystalline, having the structure of a zinc orthosilicate but differing, however, from that of willemite. The authors propose to call the yellow form β-zinc orthosilicate. F.J.H.

BOOKS

Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry: Vol. XXVI. Society of Chemical Industry, London, 1941. 545 pp. Price 16s.—A chapter on glass, by W. M. Hampton and R. E. Bastick, and a chapter on ceramics, refractories, and cements, by H. W. Webb, are included.

Principles of Silicate Chemistry. P. N. GRIGOR'EV. Gizlegprom, Moscow and Leningrad, 1940. 2d ed. 160 pp. Price 7.25 R. Reviewed in *Khim. Referat. Zhur.*, **4** [3] 84 (1941). M.Ho.

Spectrographic Analysis of Aluminum and Its Alloys. A. R. STRIGANOV. Edited by I. S. Vishtynetskiĭ and S. M. Voronov. Trudy Lab. Metalloobr. Zavoda. Oborongiz, Moscow, 1940. 2d ed. 84 pp. Price 8 R. Reviewed in *Khim. Referat. Zhur.*, **4** [3] 54 (1941). M.Ho.

PATENTS

Chlorination of titanium-bearing materials. F. J. CLEVELAND (Pittsburgh Plate Glass Co.). Brit. 548,352, Oct. 21, 1942 (March 7, 1941).

Manufacture of selenium red pigments. A. R. BOZARTH (Harshaw Chemical Co.). U. S. 2,300,196, Oct. 27, 1942 (May 10, 1940).—The process of preparing a selenium red pigment including the steps of preparing a green cake capable of yielding such pigment, heating such green cake in a closed container, venting such container at least until the initial atmosphere and any water vapor have been displaced, and maintaining in the container during the remainder of the calcination an atmosphere of selenium vapor while preventing ingress of substantial quantities of air.

Preparation of titanium dioxide. PETER TILLMANN AND FRIEDRICH RASPE (Titan Co., Inc.). U. S. 2,303,305, Nov. 24, 1942 (April 28, 1938.)

Preparing titanium dioxide. PETER TILLMANN AND FRIEDRICH RASPE (Titan Co., Inc.). U. S. 2,303,307, Nov. 24, 1942 (Nov. 14, 1939).

Production of titanium pigments. B. W. ALLAN (American Zirconium Corp.). U. S. 2,299,120, Oct. 20, 1942 (Nov. 21, 1938).

Titanium dioxide pigment. G. F. NEW (Canadian Titanium Pigments, Ltd.). Can. 406,204, July 21, 1942 (Feb. 12, 1940). G.M.H.

Titanium oxide production. J. L. KEATS AND H. M. STARK (E. I. du Pont de Nemours & Co.). U. S. 2,301,412, Nov. 10, 1942 (July 6, 1939).

General

Adsorption process for removal of soluble silica from water. L. D. BETZ, C. A. NOLL, AND J. J. MAGUIRE. *Trans. Amer. Soc. Mech. Engrs.*, **63** [8] 713–20 (1941).—Magnesium oxide has been shown to be particularly valuable in the removal of soluble silica from water. An adsorption process for silica removal has been recently developed which is particularly well adapted for use in conjunction with hot-process lime-soda softening, causing no increase in the quantities of either lime or soda ash. Removal of the silica from solution is effected, not by a chemical reaction but by adsorption from solution. Adsorption data correspond to Langmuir and Freundlich adsorption isotherms. An outstanding advantage of this process is the fact that the solids content of the treated water is decreased rather than increased. No increase in the total solids content of the treated water results, as would be the case with the use of reagents such as ferric sulfate and magnesium sulfate. In common with other adsorption processes, the last traces of silica are the most difficult to remove. To illustrate what can be accomplished in this respect, data are presented from an actual full-scale plant test in which a silica content of 6.3 p.p.m. in the raw water was reduced to an average of 0.6 p.p.m. in the treated water. Experience has also been gained in the treatment of a natural water in which the silica content was reduced from 56 p.p.m. to 1 p.p.m. in the treated water. Illustrated. F.G.H.

Anthraco-silicosis among bituminous coal miners. R. H. FLINN, H. E. SEIFERT, AND H. P. BRINTON. *Ind. Med.*, **11** [10] 470–73 (1942).—A comprehensive study was made

of 507 workers in bituminous coal mines to ascertain whether they had been subjected to significant exposures of disease-producing dusts. Sixteen cases of anthraco-silicosis were found, none advanced or seriously disabling; one second-stage but no third-stage case was found. As shown by X-ray changes, the lung-field markings of the affected workers were similar to markings found among anthracite mine workers who had early anthraco-silicosis, but no shadows indicated advanced silicosis as was observed in 3.9% of the anthracite workers. All 16 men had been employed principally in underground occupations. Their free-silica exposure was thought to be a result of work at the coal face, which involved handling "bony" (coal residue), rock dusting, and the dispersion of fine sand in the haulage ways. Engineering control methods were recommended, including the use of water at points of dust generation and adequate ventilation of work places, to reduce the dust concentrations to less than 10 million particles per cubic foot of air. By wet-washing systems and local exhaust ventilation, the dust incident to coal preparation can be reduced from 34 million particles to 2 million. 10 references. K.R.

Burning pulverized anthracite in steam power plants. C. H. FRICK. *Trans. Amer. Soc. Mech. Engrs.*, **64** [4] 257–63 (1942).—After citing early installations for burning pulverized anthracite in steam power plants, F. describes in detail the present Pine Grove installation of the Pennsylvania Power and Light Co. Economic considerations entering into the decision to use this type of fuel are given. Illustrated. F.G.H.

Combustion of four fuels in one boiler. W. J. LUTZ. *Trans. Amer. Soc. Mech. Engrs.*, **64** [2] 65–76 (1942).—Present-day fuel economics has decreed the desirability of a multifuel-burning boiler, even in small- and medium-sized installations. L. describes the 100,000-lb. per hr. four-fuel boiler in the Harrison Gas Works of the Public Service Electric and Gas Co. at Harrison, N. J. The difficulties encountered in burning oil, tar, pulverized coal, and pulverized fuel-pitch in the same burner and their successful solution are reported in detail. Illustrated. F.G.H.

Combustion of waste-wood products. H. W. BEECHER AND R. D. WATT. *Trans. Amer. Soc. Mech. Engrs.*, **63** [3] 177–81 (1941).—This paper is intended to be not a rigorous argument or a scientific treatise advocating any particular procedure in producing steam from the combustion of wood waste, but rather the compilation of essential facts made apparent by many years of experience. F.G.H.

Damper characteristics. P. S. DICKEY AND H. L. COPLEN. *Trans. Amer. Soc. Mech. Engrs.*, **64** [2] 137–54 (1942).—Only meager information is available on the design of dampers, in spite of their universal use in furnace control. Tests made by the authors have shown that the size of the damper for a given application is the most important factor in determining the flow characteristic. A simplified procedure for predicting the flow characteristic of commonly used types of dampers is offered to stimulate interest in this subject among designing engineers. Mechanical features of design are discussed, and suggestions for improvement are offered. The relative merits of different types of dampers are considered. Illustrated. F.G.H.

Deductive teaching is outmoded. WILLIS H. CARRIER. *Bull. Amer. Ceram. Soc.*, **21** [12] 313 (1942).

Development of a major principle in pulverized-coal firing. FRED L. DORNBROOK. *Trans. Amer. Soc. Mech. Engrs.*, **63** [3] 261–66 (1941).—Positive avoidance of the plastic-ash phase at all surfaces bounding the furnace has required emphasis upon heat-absorption performance of furnace surfaces. Evolution of the present-day furnace, which is practically self-cleaning, reliable, of high efficiency, and capable of operating continuously month after month under variable conditions of coal, load, and attendance, is treated from its inception in Milwaukee in 1918 to the present new installations of the Wisconsin Electric Power Co. Illustrated. F.G.H.

How healthful is your plant? A survey will tell. JOHN F. MCMAHON. *Factory Management & Maintenance*, **100** [10] 102–103, 208–12 (1942).—An investigation of plant hazards, such as dust, poison fumes, and sanitary facilities, is recommended, together with control measures. This will result in a conservation of man power, fewer absences, protection against unjust claims, and improved worker morale. N.R.S.

Instruction and research in mineral colloids. EDWARD C. HENRY. *Ceram. Age*, **37** [1] 9–10 (1941).—H. discusses the scope of colloid chemistry in relation to its application in the mineral industries. Courses of instruction and research facilities available at Pennsylvania State College, in the Department of Ceramics, School of Mineral Industries, are briefly reviewed. F.G.H.

Instructions and rules for users of high explosives and permissible explosives. ANON. *Explosives Engr.*, **20** [9] 266–68 (1942).—Instructions for handling and using high explosives are given under the following headings: (1) storing and keeping, (2) transportation on consumers' premises, (3) priming, (4) charging, (5) stemming-tamping, and (6) firing. A list of 54 don'ts and 12 suggestions for minimizing poisonous-gas hazards from the use of explosives is given. Illustrated. G.A.K.

Postwar planning. A. R. STEVENSON, JR. *Bull. Amer. Ceram. Soc.*, **21** [12] 314–17 (1942).—7 figures.

Removing the causes of worker fatigue. H. M. SCHERR. *Factory Management & Maintenance*, **100** [8] 130–31 (1942).—Illumination, seating, and other factors in worker fatigue are discussed. N.R.S.

BOOK

New Technical and Commercial Dictionary (Nuevo Diccionario Técnico-Comercial): **I, Spanish-English; II, English-Spanish; III, Conversion Tables of Weights, Measures, and Monetary Units.** Compiled by Antonio Perol Guerrero. Editorial Técnica Unida, Chemical Publishing Co., Inc., Brooklyn, 1942. 600 pp. Price $10.—This reference work is the result of many years of planning. Extensive changes have been made in the Spanish language in recent years. Many new words and their meanings, which were not in existence a few years ago, are listed in both Spanish-English and English-Spanish. Each word has been carefully translated in accordance with the plan of the Royal Spanish Academy of Languages and has been carefully checked. Compiled for the engineer and technician, the book contains more than 50,000 words used in electrical, mechanical, chemical, and marine engineering, radio, mining, industrial chemistry, plastics, and textile and other industries, modern words referring to mechanized and motorized warfare, aviation, meteorology, etc., and words used in business and commerce. Each definition includes as much information as possible. Business executives in Central and South America will welcome this book because it covers a large number of words pertinent to shipping and international trade. The dictionary contains conversion tables of weights and measures and monies with literal translations.

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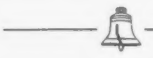

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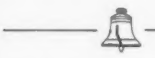

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Volume 22 January 15, 1943 Number 1

MILDRED DAVIS KEYSER

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It was only five years ago, early in 1938, that Mildred Davis Keyser first took a lesson in pottery, but since that time she has brought new life to this once-so-vital industry of the Pennsylvania German folk. A course in this craft was being offered at Ambler High School, Ambler, Pennsylvania, as part of an adult education program sponsored by the Works Progress Administration. Her instructor was William Gleaves, an English potter, who has a pottery on Doylestown Pike. (His mailing address is Montgomeryville, Pennsylvania.)

Her four children were growing up; three were already in college, and Mrs. Keyser could devote all her energies and time to this new interest. Perhaps her achievement is all the more remarkable because nothing she had done before had directly prepared her for making pottery, outside of her enthusiasm for doing things.

Mildred was born in New England of old Puritan and Bluenose stock. It was from her mother, born and reared near Granville Ferry, Nova Scotia, that she learned to appreciate and enjoy native craft work. Her mother's stories of making cloths, blankets, and hooked rugs, from the raising of the sheep and the preparation of the wool to the weaving of the cloth, left a lasting impression on her.

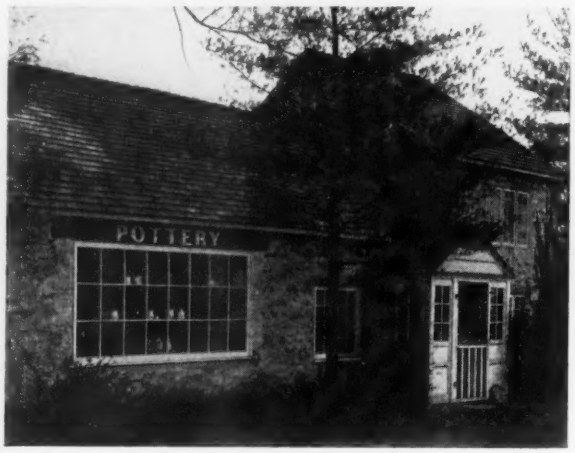
Later in Philadelphia, where she attended the public schools, and at Pennsylvania State College she continued her interest in craft work, especially in relation to occupational therapy and the development of a hobby clinic. It was in connection with the starting of a hobby clinic for middle-aged women that Mildred became interested in pottery making. This particular craft became so all-absorbing that she decided to specialize in it to the exclusion of the other arts and crafts. With a husband, C. Naaman Keyser, the eleventh generation of one of the original settlers of Germantown, Philadelphia, whose father, Dr. Naaman H. Keyser, had been a well-known authority on the history and lore of the early Pennsylvania German settlers, it seemed only natural that this interest in pottery would develop into a revival of the almost lost craftsmanship of the Pennsylvania German potters.

After two years of study and research of the old potters' ware and the folklore of these plain people, Mildred finally emerged with a product which authorities on pottery and Pennsylvania German history and folklore acclaimed as having caught the feeling and technique of the old craftsmen. The product of her workshop, the Brookcroft Pottery, has found its way to all parts of the United States and to other countries. Her hobby clinic finally has emerged as a craft school devoted entirely to the teaching of the fundamentals of pottery making as a hobby or as a means of producing a supplementary income. To Mildred's workshop have come persons from states as far removed as California.

Mildred's interest in the other crafts has been kept alive, as in her shop may be found the products of Pennsylvania craftsmen and craftswomen in metal, glass, jewelry, painted tin, painted furniture, wood carving, weaving, hooked rugs, and ceramic figures—all early Pennsylvania crafts.

Clarence Naaman Keyser, Mildred's husband, majored in horticulture at the Pennsylvania State College. They were married shortly after the United States entered the First World War, and their first year was spent in Washington, D. C., during Mr. Keyser's enlistment in Naval aviation. While Mr. Keyser was in France, Mildred did her bit on the home front working first as personal supervisor of women employees and later as production foreman for the General Electric Company. It was at this time that their first son was born. After the armistice, Mr. Keyser returned to Washington to take charge of the aerological service for Naval aviation; he remained there for two years. During this time, their twins were born. In 1922, Mr. Keyser returned to his landscaping profession.

The Keyser family, now numbering five, moved back to Philadelphia in the early 1920's and then to a farm near Plymouth Meeting, Pennsylvania.



The Brookcroft Pottery

Starting from Scratch*

"They live on a thirteen-acre farm which was almost a wilderness when they bought it over twenty years ago. Their investment was $20 cash down, and the rest was paid in small installments as the farm produced its keep. In the two decades that followed, they have cleared the ground, reared four fine young people, raised plenty to eat, and put a little nest egg aside for emergencies. Mr. Keyser's income during most years averaged $25 a week. But being a farsighted, foresighted Dutchman, even on that amount he was able to start insurance for each child the day he or she was born—college insurance that would help them through school.

"On the little farm you will find hundreds of trees, white pine, red pine, blue spruce, and Scotch pine. The sons set

* Taken by permission of the Stores Publishing Co., Inc., from an article in the April, 1942, issue of *Woman's Day* entitled "She Makes the Potter's Wheel Hum," by Clara Belle Thompson and Margaret Lukes Wise.

them out as seedlings, so that, when the time came for college, some could be sold as needed to augment the insurance.*

"Naaman, Junior, took a Master's degree at Ohio State University; Jerome attended Wharton School, University of Pennsylvania; June (Jerome's twin) was graduated from Pennsylvania State Teachers' College; and Rosemary, the youngest, is at Penn State taking the pre-medical course.

"Little money, lots of hard work, a comfortable home, good talk, great happiness, family solidarity, and refusal to be downed—there you have the Keysers.

Beginning of the Brookcroft Pottery

"On January 4, 1939, Mrs. Keyser packed a basket of her pottery and took it to the Woman's Exchange of Jenkintown. She asked the women in charge to set the price, for she hadn't the faintest notion what the things were worth. They took all she brought, $2.75 worth, and paid cash. With that money in her hand, standing there in that fine exchange, Mrs. Keyser had the strangest feeling come over her—the sudden, sure conviction that here was she, a little quiet, home woman, embarked on a real money-making business.

"And that was the start of a whole new world, a world of customers, of contacts, of widened teaching.

"The housing of this little home industry has grown way out of its small cellar workroom. The big sturdy old barn that stands hard by the house has been pressed into service. Two large rooms are finished, and there is plenty of other space ready in case of expansion. One of the completed rooms is used for the making of pottery; the other for its display.

"The whole makes a brave showing, warm browns and greens, rich reds and ambers. The old Dutch painter, Rembrandt, would have felt at home in this room, and so would that other Dutchman, Peter Stuyvesant, when he was buying and selling New York.

"What kinds of pottery pieces does Mrs. Keyser make? There is a brisk demand for her marriage plates, which are often bought by husbands (whom Mrs. Keyser finds to be better rememberers than wives) for wedding anniversary gifts. These marriage plates carry the date of the wedding and the names of the two most concerned and are an elegant souvenir for the happy, surprised wives. The $5 ones are more popular than the $10 ones, but both sell well.

"Fifty-cent and one-dollar items are the most popular of all. In this range come ash trays 50 cents, toddy cups 50 cents, mugs (which differ from the toddy cups in that they have handles) $1 and $1.50, and pitchers 50 cents, $1, $2, and $3. Pitcher collectors all over the country now boast a Keyser pitcher, and hundreds of babies start life equipped with a birth plate from parents or godmothers or doting aunts, which tells the child's date of birth, name, and perhaps the birthplace. Fifty cents to fifty dollars is the complete price range of Keyser pottery, but most of the larger, more expensive items are sold by interior decorators on consignment or on order.

"A name can be put on any Keyser order, provided the request is received early enough. A month or six weeks is sufficient.

"But how is Mrs. Keyser making out on this whole enterprise? Very well, thank you. Three years she has been in business, and each one shows a profit. The first year she took in $500.02 and the business cost $500. So she cleared 2 cents. Next year, 1940, she cleared $500. And that was the year the Carnegie Foundation sent a representative to see and study what she was doing. He told her that a craftsman could hope to make as high as $1500, that is, a very good one could. In 1941, Mrs. Keyser made $1500.

Mrs. Keyser at the wheel

"The pupils of Mrs. Keyser are a story in themselves. By word-of-mouth advertising, she has built up just about as large a group as she can handle conveniently. The students come from many sources. A woman out driving happens to pass the platter sign, turns in, and looks the place over. The first thing you know, she is back for lessons. Somebody's cousin has a fine platter and somebody wants to learn how to make some like it. Another pupil. And the grapevine is still thriving.

"Her teaching is as unique as everything else she touches. 'I insist that all my pupils take a pupil,' said Mrs. Keyser. 'I insist that part of the pay for their lessons is their own work in teaching someone else.' So, after the first lesson or two, the pupil has to scurry around and get a pupil of her own, whom she teaches at her home, not at Mrs. Keyser's. It works like this. If the pupil's pupil asks a question that can't be answered by the budding teacher, there is one stock reply: 'That comes up in the next lesson. We'll go into it then.' And the pupil 'hotfoots' it to Mrs. Keyser and gets primed with the answer.

* These trees, now grown, have not been cut and stand as living monuments to the Keyser foresight, frugality, and energy.

"Much is to be said for this technique, for the pupil must thoroughly master her lesson before she can pass it on to another. Also it crystallizes what she is learning, so she has it clearly in mind, and to stay. Naturally, if you are taking lessons in pottery, you must have it in your plans to make pottery afterward—possibly in your own home. The Keyser method just sees to it that you start to set up your own workshop at once, while the zeal is still at white heat and while you have at hand someone expert enough to advise you.

"The Keyser pupils range from five to eighty in years. They include both men and women, boys and girls. Teachers, artists, lawyers, doctors, school children, stenographers, and owners of small shops are all in her roster. The classes run from one to seven in size, but Mrs. Keyser's preference is for three or four. By far the greatest number of pupils is from the age group that Mrs. Keyser herself represents: middle age.

"Ten lessons are in the course now, and the price per lesson is considerably higher than that original 25 cents. As a matter of fact, the charges for the course are $15. In lesson one, as Mrs. Keyser puts it, she teaches all she knows about pottery. The next nine lessons are supervised experience.

"Pottery made without equipment is her basic, thrifty idea. In that first lesson, nothing is used but the clay and your own two hands.

"Clay has character, rhythm, texture, design, and pattern, as Mrs. Keyser pictures it. And to be a potter, you must learn to observe the decencies of clay, never go against its character. Yet in your struggle with clay, you must not let it best you. You must maintain a will of your own. You sense this as you work with clay. . . . These seem strange words. But apparently the thought is clearly got over to the pupils, for in talking to them, there was dignity in their attitude toward the clay and an apparent understanding of its special, almost human qualities. 'I worked the clay too hard, it got tired. I had to let it rest,' was one pupil's remark. 'There's a beautiful pitcher in this clay,' said another, holding the soft wad carefully, 'if I can just get it out.' 'I was too abrupt with the clay. It couldn't respond,' was the way a third explained a wasted morning.

"Mrs. Keyser is convinced that the way you handle your clay tells a lot about your character. She will tell the new student to get some clay from the bucket. If you get huge handfuls, maybe with the idea in your mind of making a great rose jar, it could be that you are fine for big ideas without being willing to do all the groundwork it takes to accomplish them. If you take such a little amount, just a spoonful or two, you must be fond of tiny things, which is sometimes the sign of the adolescent mind. If you work too fast, that may mean you are nervous and jittery, and the clay cannot respond.

"Mrs. Keyser's pottery has been exhibited in the Women's National Exposition of Arts and Industries in New York City. In the Pennsylvania Museum in Philadelphia, in all sorts of distinguished exhibits and displays, her pottery has appeared and held its own. When a woman can start from scratch, and in three short years be nationally recognized for the work of her own two hands, can make enough to support herself if there should be need—that is an example of courage and enterprise to challenge anyone."

Clays and Decoration Motives

The first clay Mrs. Keyser used for her pottery was dug from the Pennsylvania hills, the same rich dark red clay used by the potters of the early 1800's for their slip ware. The clay now used for the Brookcroft pottery ware is a washed clay selected from Pennsylvania, Georgia, and Maryland, which provides the same red color but is of a more suitable mixture.

The slip ware was so named because the red clay was daubed or "slipped" with white clay in various decorations which, after glazing, turned cream or yellow, depending on the amount of slip used and the length of firing time. Other colors often used for the designs were green and black. This slip ware was the utility ware of the Old Dutch households and was used for all practical purposes in the kitchen and around the house.

The craft showroom

A black clay, another Pennsylvania product, is used for the elaborate sgraffito ware. Sgraffito, often called tulip ware, is a more refined form of pottery than slip ware. After a design is dug out or incised, brilliantly colored clays are painted in, which produce a polychrome effect. This elaborate ware was reserved for ceremonial platters made as wedding or anniversary presents which were seldom in household use; instead they were cherished and passed down from generation to generation. Among the Brookcroft pottery ware, there are duplicates of these traditional platters which record not only marriages but births, folk songs, proverbs, and religious beliefs, for in the life of the Pennsylvania German the past lived in the many traditions and heirlooms handed down the generations.

The tulip is frequently the decorative motive of Mrs. Keyser's pottery. Found in threes, the tulip was an emblem of the Trinity. Some say it was the symbol of "conjugal love" and, in its six-lobed form, suggested fertility, but its general use in the Dutch household indicates that it might have been the symbol of all good things—peace, prosperity, kindliness, warmth, and permanence.

The pomegranate also has its place on the Brookcroft ware, for after the tulip it was the flower most prevalent in

household decoration. It was regarded as the symbol of fruitfulness, of abundance and plenty. It was associated with luck and good fortune because of its seven petals, that cryptic and mystic number of the ages.

Mrs. Keyser's Brookcroft ware

The peacock, another motive, was regarded as the symbol of the finest and most splendid things, for there is nothing in nature so rich, colorful, and magnificent. The peacock, however, meant even more than that; he was Juno's bird, the bird of kings and a symbol of the Resurrection, so that even for the Puritan it was right to have him about.

The faun or deer, too, was often found on the Pennsylvania German ware. It may be that he was a symbol of the splendor of sport, an ancestral memory, for no doubt in earlier times herds of reindeer were usual in Germany. Or it might have been the association of deer with St. Nicholas and the pageant of winter which so endeared him to the hearts of the Dutch and German.

Like so many motives in Pennsylvania German art, the tulip, pomegranate, peacock, and even the faun probably had their origin in the Persian hangings and rugs of Renaissance times. Brought with so much effort from the East, on caravans and on mule trains, the sunny reds and yellows of the Persian art were instinctively heart-warming to the Teutons in their grey north. The gay and beautiful designs filled the need for color, and they were assimilated into German folk art so thoroughly that they are practically regarded as native to the German art.

Mildred, a Mother

The photographer caught the happy, big-hearted, broad-minded, resourceful, industrious, and thrifty mother which is Mildred, the heroine of this story. She loves people and people love her. It is no wonder that she was a personal supervisor of women employees and a production foreman at the General Electric Company during World War I. And when Mildred led that family of five to the thirteen-acre farm near Plymouth Meeting with no capital other than a resourceful husband and youngsters willing to help, no farm equipment, and no modern conveniences, it was again her natural gift to live fully that carried them through. The forest of trees which they planted, and which yet stands, the concrete swimming pool which the boys built, the shanties on the Boys' and on the Girls' Town "locations," the formal vegetable and flower gardens, the ingenious piping of spring water into the house, and the installation of a modern sewerage system are evidences of work aplenty done by the whole family. This lovely family solidarity bespeaks the greatness of the motherhood of Mildred and the fatherhood of Naaman. They, as a team, have wrought wonders with their children, their farm, their home, and now with their Brookcroft Pottery.

ROLE OF THE AMERICAN CERAMIC SOCIETY IN CERAMIC STANDARDIZATION

The following is a condensed report of the discussion on "The American Ceramic Society's Role in Ceramic Standardization" which formed a part of the program of the Fellows of The Society at the Annual Meeting on April 19, 1942, in Cincinnati, Ohio.

—ROBERT B. SOSMAN, *Dean of the Fellows*

Arthur S. Watts of the Ohio State University, Columbus, Ohio, a former chairman of The Society's Committee on Standards, presented the opening paper, which is reproduced here in full.

WHAT THE AMERICAN CERAMIC SOCIETY CAN AND SHOULD DO IN THE FIELD OF STANDARDIZATION

BY ARTHUR S. WATTS

What The Society can do depends on the legitimate activities of The Society as interpreted by the Board of Trustees. During my service as chairman of the Standards Committee, I tried several times to promote the development of standards as a Society activity, but each time Dr. Purdy ruled that The Society should limit its activity to the endorsement of standards developed by the American Society for Testing Materials and other organizations, and the Board of Trustees supported him in his ruling. The question is also one of policy, for the promotion of standards may cause arguments which are not conducive to harmony.

The Constitution and Articles of Incorporation of The Society do not include the development of standards. Whether work on standards could be developed in separate Divisions and merely endorsed by The Society without provision for the same through a change in the Constitution is a question for the Rules Committee.

What The Society should do is a matter of personal judgment. I believe that the development of standards in

terminology and in tests but not in products can and should be a prominent activity of The Society and that this would gain for The American Ceramic Society a greater prominence and prestige than any activity in which The Society has engaged.

Ceramic terminology is hopelessly confused. We find terms constantly misused, and the public is often misled with no remedy, because no standard definition exists. Ceramic products are tested for the same property by widely different procedures, and the data are not comparable in most cases.

The American Ceramic Society should develop a program by which definitions, tests, and specifications now existing may be studied and, if worthy, be approved as our official standards. If they are found to be unsatisfactory, we should carry our comments to the sponsor of the standards with the object of having the faults corrected. Where no standards exist, we should appeal to the Divisions of The Society concerned with the subject and ask that a committee be created to study the matter and present data and recommendations. Each topic should be referred to a separate committee.

If such a program is attempted, I urge that a law be created making no standard official or final until after at least three years' service as a Tentative Standard. This procedure, which is followed by A.S.T.M., is the only security against faulty standards, which would injure the prestige of all of our standards.

Statements by Mr. Sullivan, Mr. Heath, and Professor Whittemore

DEAN SOSMAN: We shall next hear the views of one of our members in the American Society for Testing Materials, John D. Sullivan of the Battelle Memorial Institute, chairman of Committee C–8 on Refractories of A.S.T.M.

MR. SULLIVAN: We could have a good scrap now, because I do not believe in the same philosophy as Professor Watts, but I have not prepared anything formally. I merely want to make some informal remarks.

The American Ceramic Society can do a lot in the line of standards and is doing so at the present time. It can function better, however, through existing societies that handle standards, such as the American Society for Testing Materials, the American Standards Association, and a great number of other organizations whose responsibility is the handling of standards and testing.

Fundamentally we must take the position that a standard should not be set up merely to have a standard. There must be a necessity or a demand for a standard before it is set up, and it takes a lot of time and experience before a standards group can function properly, do good, and bring out sensible, sound standards.

There is one thing that is absolutely necessary. We should have an organization which is more or less permanent in character—not a group of persons who are appointed annually. That is one of the virtues of some of the existing standards societies. Their membership goes on and on and is added to only when somebody resigns or dies.

Some of the groups and some of the Divisions of The American Ceramic Society are active in standards. I can speak for Committee C–8 on Refractories of A.S.T.M., of which I happen to be chairman. That Committee is composed almost 100% of members of The American Ceramic Society. They actually represent The American Ceramic Society and the refractories industry on that Committee. There is a good chance that some of the other Divisions could cooperate more than they do with some of the existing standards societies. There is a certain amount of cooperation at the present time, but my recommendation would be, as far as this Society is concerned, to cooperate more with the existing standards organizations.

DEAN SOSMAN: Mr. Sullivan represents, in a way, the viewpoint of the A.S.T.M. in presenting this case. The Society also has representatives in the American Standards Association, which is the other large organization devoted primarily to American standards. Frederick Heath, Jr., of the Owens-Corning Fiberglas Corp., Toledo, Ohio, represents us on their Project A–62 (Sectional Committee on Coordination of Dimensions of Building Materials and Equipment). We would like to hear their point of view.

MR. HEATH: There is one point in connection with a standard that has not been mentioned yet. To be really effective and receive acceptance, a standard should have its derivation not only among producers of the material but among consumers as well and possibly among other general interests that might be concerned with it.

I can visualize within this Society the purchase of certain raw materials in which the members would be consumers, but by and large the standardizers would be concerned with the products as producers, and as such they represent only half of the picture. There might be occasions where the consumers' viewpoint would be neglected. The A.S.T.M. and the A.S.A. are conscientious in trying to develop the consumers' viewpoint along with the producers' viewpoint, with a good balance of free technical advice from many of the professional schools and testing laboratories and other institutions which are classed as "general interests."

The particular project with which I am associated in the American Standards Association is a rather broad subject which touches many industries. It is a coordination of building materials and equipment which covers ceramics, steel, lumber, and many other things that might go into a structure, and it cannot be confined to any one part. The fact that such standardization as there is has been arrived at within each industry individually possibly has been a hindrance to what would become the objectives of this broadened standardization program.

In fact, it was only when the American Standards Association investigated and became aware that there was a demand for a broader coordinated standardization program in building materials and equipment (applying particularly to dimensions, of course) that they called together representatives of some fifty trade associations and other organizations that were concerned; consequently, it was possible through such a mechanism to develop a broader viewpoint. That particular project was sponsored by the American Institute of Architects and the Producers' Council and by no other means would it be possible to undertake such a job.

DEAN SOSMAN: Let us hear from the chairman of our own Committee on Standards, J. W. Whittemore of the Virginia Polytechnic Institute, Blacksburg, Va. As you know, some of the members of the Committee are appointed by the Divisions, whereas the chairman is appointed by the Trustees to represent The Society as a whole.

MR. WHITTEMORE: I am riding the fence between the remarks that have already been made. Our Divisions can do a lot in standards work. There are many things that we accept as standards without ever having put them in print, and there are a lot of people interested in ceramics who would like to find that information. That is brought out especially this year by the work the White Wares Division is doing. They are bringing up to date some of the standards that were printed back in 1928. Then we are having a symposium on ball clay,* that in reality is standards work.

First of all, we should cooperate with the A.S.T.M. and the A.S.A. They are geared and built up for just that work. They have an organization that can study a standard after it has been introduced and see to it that it is kept up to date.

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* Published in the November, 1942, *Bulletin*.

As Mr. Sullivan has said, the members of those different committees are continued from year to year. They are experienced and are able because of the continuity of membership to follow up on all their standards. But in our Society we have members who are outstanding in the ceramic field and because of that should be helping with the work of these different standards organizations. There are too few of our members who are on these committees. There are many A.S.A. and A.S.T.M. committees which deal with ceramic products that have few members from The American Ceramic Society.

Also our Society should have direct representation of The Society itself on more of the standards committees. There are several of them dealing with ceramic materials in which we do not have a representative.

And, last of all, when a man is named as a representative of The Society on a particular standards committee, he should see to it that he works on its problems and that he reports back to The Society on the work of that particular committee. Every one in The Society should know about the work within the A.S.T.M. and the A.S.A., but there are many members who do not have a chance to see the *Proceedings* of the different organizations and who should have a chance, through our own publications, to find out about these standards.

DEAN SOSMAN: We have had a good statement, from these four different viewpoints, of the possibilities of standards. I would like to hear some general discussion on the same subject.

General Discussion

PROFESSOR WATTS: There is a great deal of so-called standardization work which does not properly belong in, or at least is not recognized in, such organizations as A.S.T.M. and A.S.A. Apparently there is nothing you can do about it. They are not sufficiently interested to create a committee to cover those particular subjects. For instance, what is meant by a "hard glass?" A "soft glass?" What is meant by "insoluble glass?" By a "high temperature?" The same situation arises in dozens of ways, as we find when someone comes to us with a statement that "this product is reported as thus and so; it has a porosity of so much," and asks us either to confirm or contradict the statement. We ask how the porosity was determined, and we get such statements as "it was soaked overnight in water." Sometimes that is a convenient way to find out how *little* water it will absorb. So there is a definite service which The American Ceramic Society can perform through standardization.

I specifically pointed out that I did not believe The American Ceramic Society should concern itself with products or products specifications, but I do believe that the matter of terminology, the matter of test procedures, and a lot of things of that kind are not going to be bothered about or, if they are, they are going to be left vague. I have found after about nine years in the A.S.T.M. and A.S.A. that you can really do a pretty good job in either direction if you wish to do it.

I was chairman of the Nomenclature Subcommittee on C-8 of A.S.T.M. for a good many years, and we tried diligently to get a satisfactory nomenclature set up, but we found that we had a lot of opposition, due not to any disposition to mislead, but to the lack of appreciation of the necessity of accurate, precise methods of determination.

MR. HEATH: I would like further to clarify my remarks as certainly not being in opposition to the program that Professor Watts has suggested here. May I go a step further in connection with the A.S.T.M. Committee on Hollow Masonry Units. It represents not only ceramic materials but also concrete blocks and other cement products; hence it shows in its functioning quite a contrast in operations. All the dirty linen of the clay industries is aired in the Committee meetings, but if the cement industry comes in with a recommendation it passes, that is all there is to it. There has been behind that recommendation an organization of some kind which has made a decision and offered a recommendation from the producers' viewpoint for consumer acceptance, but they themselves do not endeavor to promulgate that standard—they promulgate it through the American Society for Testing Materials. It would be helpful for us to have more discussion and stimulate more research, in many instances leading toward methods of testing, etc. It would help us make the work of A.S.T.M. and A.S.A. more effective.

G. A. BOLE (Ohio State University, Columbus Ohio): There is more to it than has been pointed out. The dinnerware industry is not represented in the A.S.T.M. or the A.S.A. The A.S.T.M. has interested itself only in materials for industrial use. The same thing apparently holds true for the A.S.A. The dinnerware products do not come under this heading. There is certainly something to be said for the development of test methods and purchase specifications for dinnerware under auspices where dinnerware manufacturers themselves take part in formulating the test methods and the resulting specifications. Most ceramic products are well taken care of as it is. Certainly refractories, structural materials, and electrical porcelains are taken care of under the A.S.T.M. specifications and, as Mr. Heath has said, a beginning has been made on building materials in the A.S.A. I do not see any possibility of the dinnerware industry being taken care of either in the A.S.T.M. or the A.S.A. If there are other views I would like to hear them.

LOUIS NAVIAS (Research Lab., General Electric Co., Schenectady, N. Y.): It might be well to review the work of the A.S.T.M. Committee C-14 on Glass and Glass Products, which was established a few years ago. The glass industry, as producers and consumers, wished to get together on standards, and they decided to do it through A.S.T.M. It so happened that most of the members of that Committee were also members of the Glass Division of The American Ceramic Society. To obtain a national and international standing, they decided to work through A.S.T.M. They had many meetings with the English, the Germans, and other Europeans so that they could all agree internationally on some of the properties of glass. The group even went so far as to parcel out problems, and they said to the British, "Why don't you take viscosity or some other problem of glass?" They talked to the Germans and the French and gave them some problems, and the Americans took some other problems. And they have been working with that goal, at least up to a certain point in 1939. Now the Committee has actually defined the term "glass." They are not all agreed upon that definition, but they have gotten together and have come to a conclusion which they could put on paper. You will find the definition of glass as a tentative standard in A.S.T.M. They have agreed on methods of testing bottles, as well as on the chemical compositions which characterize certain kinds of glass. So far, Committee C-14 has probably half a dozen tentative standards which have been promulgated within the last few years.

It all depends upon the viewpoint you wish to take toward standards. I assume that the Glass Division could have done the same thing under the auspices of The American Ceramic Society, because practically all of the individuals involved in Committee C-14 are members of the Glass Division, but they preferred to have this wider influence. I doubt whether A.S.T.M., as such, would have allowed that group to function. The American Society for Testing Materials insists that there be three parts to the personnel of each committee, namely, the consumer interests, the producer interests, and what they call "general interests." They even go so far as to insist that the chairman of a committee should not be a producer. They also maintain that both the consumer and the producer have equal say. That seems to me to be very vital.

To answer Professor Watts, I do not see why the White Wares Division could not continue with standards if they thought it wise. But there is one difficulty which our Society faces in taking up standards if we look at past history, namely, the lack of sufficient continuity of interest and effort required to keep standards alive. Even the work of the White Wares Division this year will be old next year. In fact, I am in the embarrassing position of

presenting to the White Wares Division, within a couple of days, some tentative specifications and standards which are already in print,* and I will have to tell them that these are already out of date. This matter of keeping standards alive is something which needs a vigorous group willing to review them annually and not just every twenty years.

R. M. KING (Ohio State University, Columbus, Ohio): You might like to hear what the enamel industry has done. About five years ago, we found that the consumer was setting the standards, particularly for testing; of course, test standards are necessary before an intelligent product standard can be set up. We found also that the consumers were willing to give the industry an opportunity to set their own standards, and, even if there was no direct threat, we saw the handwriting on the wall. If we did not set the standards, the consumer would, so the Porcelain Enamel Institute undertook the job. A program of test development was started at the National Bureau of Standards, which contributed some funds, men, and time. Later, the Institute added a full-time man. About nine tests have been developed and published, several of which have been revised. At one time, we were approached by the A.S.A. or the A.S.T.M. to let them handle the matter or officially promulgate the standards, but it was found on investigation that the Porcelain Enamel Institute was not receptive to a change in sponsorship.

Usually if the industry is doing the job, much more cooperation and more funds are forthcoming to back a program than when committees from The Society do the work.

J. C. HOSTETTER (Hartford-Empire Co., Hartford, Conn.): I am much interested in this discussion of standards and specifications, and I should like to advocate strongly that The Society, as such, or the Divisions, either on their own or working with A.S.T.M. or A.S.A., do more work on standards, especially on nomenclature and definitions.

It has not been brought out here in the discussion, but questions of definition have far-reaching importance. The Tariff Commission is always raising questions of terminology on such things as tariff rates and import duties. Freight rates come into the same picture. And then finally there is the question of advertising and the use of trademarks. Authoritative definitions set up by our Society would carry great weight with the various agencies dealing with these matters.

HEINRICH RIES (Cornell University, Ithaca, N. Y.): I was going to offer Dr. Hostetter my sympathy and issue a warning. When you write an article, you need to be very careful of your terms, because some cross-examiner will go through every paper you have ever printed trying to find something to prove you a liar.

E. L. HETTINGER (Willson Products, Inc., Reading, Pa.): The United States Government wants two hundred million tons of steel, and I would like to ask how many of The Society's members know what the specifications are and the necessary requirements just for welding glass alone. You cannot manufacture or fabricate steel without welding glass. This same applies to other eye-protective glasses. There is great need for product standards as well as for test standards.

N. W. TAYLOR (Pennsylvania State College, State College, Pa.): Dr. Hostetter's remarks reinforce a feeling that I have that no definitions can ever be agreed upon until we understand the nature of the material which is being defined or the nature of the procedure which is being defined. In other words, the emphasis that The Society should place is in favor of more research on fundamental properties. In the last analysis, our decision whether a material is in Class A or Class B depends upon measurable properties of the material, and what we should strive to do continually is to encourage research on these properties.

* See the February, 1942, *Bulletin*.

TESTS ON WHITEWARE MATERIALS

IV. Raw Materials Tests

By W. H. EARHART, 343 Glenmont Ave., Columbus, Ohio, and J. H. KOENIG, Hall China Co., East Liverpool, Ohio.

(*A*) Sampling of Ceramic Materials as Delivered

Carload shipments shall be sampled during unloading. Small portions shall be taken regularly and systematically so that the entire quantity of material sampled will be represented proportionally in the gross sample. If the material is received in containers, a sample shall be taken from each container which will represent all portions of the contained material.

The general sampling practice of coning and quartering shall be used preferably in reducing the gross sample to the size necessary for testing.

(*B*) Physical Tests

(1) Fineness

The fineness of a material is determined by wet-sieve analysis and by liquid sedimentation methods. Both methods complement each other, in that the coarse-to-fine gradation is measured by sieve analysis and the extremely fine to colloidal fractions are measured by the sedimentation method. Both methods shall be used for a complete and accurate specification of the gradation of fineness.

Whenever possible, a microscopic examination of the variously sized fractions shall be made and the mineral and physical characteristics shall be reported.

(*a*) Procedure for Wet-Sieve Analysis: A dry-sieve analysis is not recommended because finely divided materials tend to clog the meshes of the finer sieves and to increase in grain size owing to cohesion or agglomeration. These difficulties are not encountered with a wet-sieve analysis, so that more accurate and reproducible results may be obtained.

The sieves to be used in this determination must possess the specifications given by F. H. Norton, Massachusetts Institute of Technology, Cambridge, Mass.

To prepare the sieves for the test, wet each sieve thoroughly, top and bottom, being sure that each is clean beforehand. Assemble into a nest or series with the finest sieve on the bottom and coarsest on the top, the intermediate sieves being progressively finer from top to bottom.

Determine the moisture content of the material to be tested by drying at a temperature of 110°C. A calculated amount of the sample, as received, equivalent to 100 gm. of the dry sample, should be used. The weighed sample, if nonplastic, may be placed directly on the top sieve of the nest and carefully washed with a gentle stream of tap water; care should be taken that no water accumulates on the finer sieves because of a clogging action of the sample's fines. If this occurs, however, washing should be stopped and the nest should be jolted and rocked back and forth until all sieves are clear of accumulated wash water. Clays are especially inclined to accumulate in this way. It is therefore desirable to first thoroughly disperse the weighed clay samples in about 1000 cc. of water and carefully pour the suspension through the nest of sieves with frequent flushes of tap water to prevent accumulation on the finer sieves. The container of the suspension must be carefully washed clean of the sample and the washings should be poured through the nest of sieves.

Then thoroughly flush the top sieve with a gentle stream of tap water until most of the finer material is washed through this sieve. The sieve is then removed from the nest and immersed in a large, clean pan of water. The

level of the water should be at least 1/4 inch above the level of the screen openings, but not within one inch below the top rim of the sieve. By gently tapping one side of the sieve against the bottom of the pan of water, the fines will pass through the meshes into the pan. When it is judged that all fines have passed through the sieve, the pan of water and fines are poured through the nest of remaining sieves, the fines being washed out of the pan with tap water if this is necessary. A fresh pan of clean water is then obtained and the sieve is again submerged and tapped as previously described. If, after prolonged tapping, no traces of fines accumulate at the vortex when the pan of wash water is swirled, it may be assumed that this sieve retains no more finer material. The residue is washed to one corner of the sieve, and the sieve and residue are allowed to dry in air or in an oven whose temperature never exceeds 50°C. The weight of the dry residue is taken as the percentage of material retained by this sieve. Results do not need to be reported beyond the tenths decimal unless the residue weighs less than 2 gm.

The top sieve remaining in the nest is treated in the same manner as previously described until all of the sieves have been so treated.

At least two closely agreeing determinations should be made on each sample received for the test. If results do not agree within ±5% of the percentage residue obtained, a third determination should be made, and the average of the two most closely agreeing values should be taken as the true value for the residue on that particular sieve.

Care must be taken in the finer sieves to remove any air entrapped beneath the surface of the screen. Such entrapped air will prevent the passage of the finer particles through the meshes and thus make the analysis more difficult and inaccurate. If air is entrapped under the screen, it may be removed by briskly tapping the rim of the sieve with the hand; the sieve is not removed from the pan of water. This should be done before starting to tap the bottom of the sieve against the bottom of the pan of water to effect the separation of the fines from the residue.

(*b*) Procedure for Subsieve Grain Size: The pipette method has been used extensively in soils laboratories. Its accuracy has been recognized so generally that it has been used as a standard in evaluating grain-size determinations by other methods. As in all particle-size determinations (sedimentation), the method of dispersing the sample is very important. The dispersion should be as complete as possible and should permit reproducible results without requiring an excessive amount of time.

Andreasen Sedimentation Pipette Method*

The clay sample or plastic body shall be reduced to −1/4 inch. Then 5.50 gm. of the sample (dry basis), or enough to make a 1% suspension according to the calibrated capacity of the Andreasen apparatus, shall be placed in a 250-cc. wide-mouthed bottle which contains 200 cc. of distilled water. The bottle containing the water and sample shall be allowed to stand for 24 hr. Ten cc. of a solution of tetrasodium phosphate, made by dissolving 24.55 gm. in 500 cc. of distilled water, is added. The bottle with its contents shall be agitated by mechanically rotating end-over-end for 17 hr. The dispersed sample then shall be transferred to the sedimentation vessel and sufficient water shall be added to bring the surface of the suspension to the upper mark on the scale. For a capacity of 550 cc., this produces a concentration of electrolyte of 0.002 gm. mol. per liter.

The vessel with the suspension shall be placed in a constant temperature bath at 30°C. for 15 to 30 min. to attain the temperature of the bath. It shall then be removed, shaken by hand for 2 min., and immediately replaced in the bath. The exact time at which the shaking is stopped is noted and the stopper carrying the pipette is inserted. Ten-cc. samples shall be withdrawn at increasing intervals of time, drawing them up at a uniform rate during about 20 sec. The times for drawing the samples are 3 min., 30 min., and 1, 2, 3, 5, 8, 24, 48, and 96 hr. Different intervals may be preferred for materials other than clay. These intervals may be chosen arbitrarily, but they should be adhered to in order to save time in calculating the grain sizes. The samples shall be drained into small weighed beakers, evaporated to dryness at 110°C., and the percentage by weight of the original sample determined. A correction must be made for the electrolyte in the weight of the dried sample. All weighings shall be made to 0.1 mgm.

The grain sizes shall be calculated from Stokes' law, which may be expressed as follows:

$$r = \sqrt{\frac{9h\eta}{2(D_1 - D_2)gt}}.$$

Where r = radius of spherical particle (cm.).
η = viscosity of suspending medium.
h = distance (cm.) between liquid surface and pipette tip when sample is drawn.
D_1 = true specific gravity of particles.
D_2 = true specific gravity of suspending medium.
g = gravitation constant.
t = time (sec.) from start of test.

Each sample drawn has a smaller particle size than that corresponding to the falling velocity of the particles, h/t, as all particles of larger size have fallen below the level of the pipette tip. Duplicate tests shall be made on each sample. If the weight percentages do not check within 1%, the test shall be repeated.

Results may be plotted in a smooth curve with grain sizes as abscissas and the percentages by weight finer than the corresponding sizes as ordinates. From these basic curves, the grain-size distribution for any desired intervals may be obtained, and the results may be plotted to show this distribution.

Casagrande Hydrometer Method*

The hydrometer method may be preferred for a control test when a large number of tests must be run. The Andreasen pipette method is time-consuming and requires many weighings.

(2) Preparation of Plastic Test Specimens

The materials are prepared for the test in a manner similar to the treatment they would receive in practice. Thus, ball clays and kaolins are usually blended together with approximately 50% of nonplastic ingredients, blunged in water, and lawned and filtered during the preparation of a whiteware body; some plastic fire clays, however, are often only moistened and pugged. The following procedures are therefore suggested for the preparation and testing of plastic materials.

Ball clays and kaolins may be prepared and tested either alone or in combination with an equal amount of potter's flint. In either case, the body is prepared by thoroughly blunging it with a sufficient amount of distilled water to form a smooth viscous slip free from any lumps of undispersed material and viscous enough to prevent any classification of nonplastic ingredient. No deflocculating agent should be used to facilitate blunging. The slip is passed through a 100-mesh sieve to remove any foreign matter. The lawned slip may then be dewatered by the use of a filter press or cloth-lined plaster bowls. The plastic material thus obtained is hand-wedged or pugged until no internal imperfections such as air-pockets or laminations are observed on the cross section obtained when the body

* See "Grain Size of Whiteware Clays as Determined by the Andreasen Pipette," by G. A. Loomis in *Jour. Amer. Ceram. Soc.*, **21** [11] 393–99 (1938).

* See "The Hydrometer Method for Mechanical Analysis of Soils and Other Granular Materials," by Arthur Casagrande. This paper, the nomographic solution of Stokes' law, and the temperature correction chart may be obtained from the Laboratory of Soil Mechanics, Massachusetts Institute of Technology, Cambridge, Mass.

is cut by a fine wire. The body is then ready to be made into test specimens.

When clays are prepared by simply moistening them with the requisite amount of distilled water and pugging, the extruded column must be free from internal laminations before the body is made into test specimens. De-aired pugging may or may not be used.

It is very important in all cases that the method of preparation shall be stated briefly in reporting the test results.

At least seven test specimens are prepared to determine the drying properties, and seven specimens are prepared for each firing temperature employed. Results are reported as the average of not less than five determinations for each test.

For the determination of water of plasticity, volume shrinkage, porosity, absorption, bulk specific gravity, and apparent specific gravity, 2- by 1- by 1-inch specimens are a convenient size to use. The plastic volume (Vp) is determined as soon as these specimens are made by immediately weighing them in air (Wp) and when submerged in kerosene (Wk).

$$\text{Plastic volume} = \frac{Wp - Wk}{0.800},$$

where 0.800 is the specific gravity of the kerosene used.

For the determination of flexural strength and measured linear shrinkage, plastic bars, 1 in. square by 7 in. long, may be used. When these specimens are made, they are transferred to plaster boards and marked with pointed calipers whose tips are set exactly 100 mm. apart.

All plastic specimens are dried slowly at room temperature until they have lost all outward appearance of containing any moisture. Covering all specimens with a thin cloth during air drying will help to prevent the formation of cracks and warpage. The air-dried specimens may then be placed in a drier and dried at 110°C. (±5°) for at least 20 hr., after which the dry properties may be determined or the pieces placed directly in the kiln and fired to the desired temperature.

In the firing of all test specimens, a set of pyrometric cones should be placed near the pieces to assure the accurate measurement of firing conditions at that point.

(3) Physical Properties in the Dry, Unfired Condition

Thoroughly dried 2- by 1- by 1-inch specimens are taken from the drier (110°C.) and weighed immediately to the nearest 0.05 gm. The specimens are then placed in a clean, dry pan of a suitable size to hold all the specimens. Kerosene (specific gravity = 0.800) is then carefully poured into the pan until the level of the liquid is halfway up the sides of the specimens. After soaking for 1 hr., the depth of the kerosene is increased until the surface of the liquid is just below the level top of the test specimens. The specimens are then soaked until they appear to be completely saturated, after which the level of the kerosene may be raised until the specimens are submerged to a depth of at least $^1/_2$ in. After soaking for at least 6 hr., the specimens are weighed suspended in kerosene and then weighed in air after all excess kerosene has been carefully wiped off with a dry cloth. (NOTE: If the facilities are at hand, the submerged specimens may be placed in a vacuum chamber and evacuated to obtain more complete saturation. Tests have shown, however, that with the ordinary whiteware body or washed kaolin this treatment has very little effect on the results obtained by the method previously described.) Only excess surface kerosene should be removed from the specimen before weighing in air. The plastic, dry, saturated, and suspended weights of each test specimen are used to calculate the drying properties of the test body, as follows:

$$\text{Drying volume shrinkage (\%)} = \frac{Vp - Vd}{Vp} \times 100 \text{ or } \frac{Vp - Vd}{Vd} \times 100.$$

$$\text{Water of plasticity (\%)} = \frac{Wp - Wd}{Wd} \times 100 \text{ or } \frac{Wp - Wd}{Wp} \times 100.$$

The drying volume shrinkage and water of plasticity may be expressed in terms of either the dry or plastic state, but the results reported must plainly indicate which basis of evaluation was used.

"Shrinkage water" is that portion of the water of plasticity which is driven off up to the point where shrinkage ceases, or

$$\text{Shrinkage water (\%)} = \frac{Vp - Vd}{Wd} \times 100 \text{ or } \frac{Vp - Vd}{Wp} \times 100.$$

"Pore water" is that portion of the water of plasticity which is driven off from the point where shrinkage ceases until the clay piece has reached constant dry weight at 110°C., or

$$\text{Pore water (\%)} = \text{Water of plasticity (\%)} - \text{shrinkage water (\%)}.$$

$$\text{Dry porosity (\%)} = \frac{Ws - Wd}{Ws - Wl} \times 100 = \frac{\text{Volume absorbed}}{\text{Dry bulk volume}}.$$

$$\text{Dry absorption (\%)} = \frac{Ws - Wd}{Wd \times 0.800} \times 100 = \frac{\text{Volume absorbed}}{\text{Dry weight}} \times 100.$$

$$\text{Dry apparent specific gravity (\%)} = \frac{Wd \times 0.800}{Wd - Wl} = \frac{\text{Dry weight}}{\text{Dry apparent volume}}.$$

$$\text{Dry bulk specific gravity (\%)} = \frac{Wd \times 0.800}{Ws - Wl} = \frac{\text{Dry weight}}{\text{Dry bulk volume}}.$$

Where Wp = Plastic weight of specimen in air.
Wd = Dry weight of specimen in air.
Ws = Weight of specimen saturated with kerosene.
Wl = Weight of saturated specimen suspended in kerosene.
Vp = Plastic volume of the specimen.
Vd = Dry, unfired volume of specimen = $\frac{Ws - Wl}{0.800}$.

0.800 = Sp. gr. of kerosene used.

Results should be reported to the nearest 0.1 decimal place and should represent the average of at least five determinations which do not vary more than ±3% from the average. (NOTE: It has been found that for 2- by 1- by 1-in. specimens the weight method will give data which is more accurate and useful than may be obtained by the overflow volumeter. Results also may be more quickly obtained.)

(4) Linear Drying Shrinkage

The linear drying shrinkage is determined by measuring the distance between reference marks on the 7- by 1- by 1-inch specimens after they have been thoroughly dried at 110°C. and cooled in a desiccator. The shrinkage is expressed in terms of the original plastic length of the specimen. Inasmuch as the reference marks on the plastic bars are exactly 100 mm. apart, the shrinkage is obtained as the difference between the original 100-mm. length and the dry length.

Linear drying shrinkage may also be calculated from the volume drying shrinkage as follows:

$$100\left[\sqrt[3]{1 + \frac{\text{Volume shrinkage}}{100}} - 1\right].$$

Results need not be reported beyond the 0.1 decimal place unless an average of more than fifteen determinations is used.

(5) Apparent Specific Gravity

Same method as given verbatim in the 1928 American Ceramic Society Standards Report.*

(6) Bulk Specific Gravity

Same method as given in 1928 Standards.

(7) Rate of Slaking

Same as 1928 Standard test. No change.

(8) Physical Properties in the Fired Condition

The tests used in the determination of the fired physical properties are described in the 1928 Standards Report. The following additions, however, are proposed:

Ink- or Dye-Penetration Test: In materials where the measured absorption of the fired material is less than 0.2% the stain test should be used to further indicate the degree of vitrification. This test may be made with either ink or with an organic dye.

The ink test is made on both the unfractured and freshly fractured surface of the dry, fired specimen. Drops of water-soluble ink are applied to both types of surfaces. After the ink on the specimen is dry, the stain is thoroughly scrubbed under a stream of warm running tap water. All efforts should be made to wash away the stain completely.

The degree of vitrification should be reported as yielding a dark stain, a light stain, or no stain. No visible stain indicates complete vitrification of the material.

The fired volume should be determined by the weight method rather than by the overflow volumeter method, inasmuch as the first method is faster and more accurate.

(9) Pyrometric Cone Equivalent

The same method as given verbatim in the 1928 Standards Report.

In the 1928 method, page 452, however, lines 21 and 22, which read "If desired, the test pieces may be bisquited at a temperature safely below vitrification before mounting," should be omitted from the procedure and should be changed to read as follows: "This test must be made on the material as received, without subjecting the material to any preliminary calcination to facilitate handling of the test cones."

The P.C.E. of a material may vary as much as two cones, depending on whether the material is tested as received or whether the test cones are subjected to preliminary calcination before testing.

V. Raw Materials Standards and Specifications

By B. C. Burgess, United Feldspar & Minerals Corp., Spruce Pine, N. C.

(*A*) Feldspar

The principal fluxing ingredient in whiteware. A silicate of alumina and the alkalis, principally potash and soda, found in nature in pegmatite dykes and sorted by hand into grades suitable for grinding.

Specification: The grade (chemical analysis) and grinding (fineness) shall be in accord with Commercial Standard CS23–30 of the National Bureau of Standards.

In cases where the limits of analysis provided by CS23–30 are too wide, the purchaser may substitute a further specification. Illustration: Feldspar Specification CS23–30 Grade 67–61, Mesh 230.

Constituents shall be maintained within the following limits:

	Maximum	Minimum
SiO_2	67.7	66.3
Al_2O_3	19.2	18.2
Fe_2O_3	0.1	
CaO	0.5	
K_2O	12.5	11.5
Na_2O	2.3	1.7

The fusion test made in accord with IV (*B*) (9) shall be within ½ cone of P.C.E. 10 and shall be free from specks and texture changes.

(*B*) Flint

The principal skeleton material of whiteware bodies. Silica (SiO_2), crystal, amorphous, or cryptocrystalline in nature, such as quartz, flint, silica, chert, ganister, tripoli, and sandstone.

Specification: The chemical analysis shall be within the following limits:

	Maximum	Minimum
SiO_2		98.50
Fe_2O_3	0.10	

The grinding (fineness) shall be in accord with Commercial Standard for Feldspar CS23–30.

In cases where a more detailed specification is required, the purchaser may substitute further specifications. Illustration: Flint Specification Grade ACS Standard (SiO_2 Minimum 98.50% and Fe_2O_3 Maximum 0.10%); Grinding CS23–30, Mesh 200. The flint must be calcined to not less than 2300°F. before grinding. The fusion test made with 50% of 67-61 feldspar and IV (*B*) (9) shall be within 1 cone of P.C.E. 13 and shall be free from specks and texture changes.

VII. Body Tests

By R. F. Geller, National Bureau of Standards, Washington, D. C.

(*A*) Expansivity (Linear Thermal)

There are several methods to select from for expansivity measurements. The selection shall be determined by (1) the size and shape of the specimen needed to be truly representative, (2) the maximum temperature to which determinations are desired, and (3) by the desired accuracy of the measurements. The more important methods are described briefly as follows:

(1) Interferometer method: The interferometer method of measuring thermal expansion is very accurate. It is particularly desirable for small specimens, and frequently small specimens are the only kind available. Small pieces of glaze may be chipped from a glazed article and their expansion may be determined by this method. Pieces of body may also be ground from plates and similar articles. Details of the procedure and precautions to be exercised are described by G. E. Merritt ("Interference Method of Measuring Thermal Expansion," *Jour. Research Nat. Bur. Standards*, **10** [1] 59–76 (1933); R.P. 515) and by J. B. Saunders ("Improved Interferometric Procedure with Application to Expansion Measurements," *ibid.*, **23** [1] 179–95 (1939); R.P. 1227).

(2) Direct measurements: Direct measurements with an apparatus and procedure such as described by Wilmer Souder and Peter Hidnert ("Measurements on the Thermal Expansion of Fused Silica," *Bur. Stand. Sci. Paper*, No. 524, 23 pp. (1926)) are probably the most accurate to be obtained with fairly large specimens. This method is advocated if high accuracy and the use of large specimens is desired. The maximum temperature will be ordinarily about 1000°; with more expensive construction, however, the method and principle could be used at considerably higher temperatures.

(3) Fused quartz dilatometer: This apparatus will take approximately the same size and shape of specimen used for direct measurements, but it is subject to greater errors, especially if the specimens are liable to deform under the conditions of test. The maximum temperature usually is limited by the fused quartz, which will begin to deform

* *Jour. Amer. Ceram. Soc.*, **11** [6] 335–534 (1928).

at about 1100°C. The apparatus is described by Peter Hidnert and W. T. Sweeney in "Thermal Expansion of Magnesium and Some of Its Alloys," *Bur. Stand Jour. Research*, **1**, 771–92 (1928); R.P. 29.

(4) Porcelain dilatometer: This apparatus and method is a modification of the fused quartz apparatus; made of porcelain, it can be used to make determinations at temperatures well above 1100°C. It is described by R. F. Geller and E. N. Bunting in "Length Changes of Whiteware Clays and Bodies during Initial Heating, with Supplementary Data on Mica," *Jour. Research Nat. Bur. Standards*, **25** [1] 15–40 (1940); R.P. 1311.

Modifications of methods (3) and (4) are described by W. Steger ("Expansion and Shrinkage Measurements on Unfired Ceramic Bodies," *Ber. Deut. Keram. Ges.*, **19** [1] 2–22 (1938)); R. F. Geller and R. A. Heindl ("Progress Report on Investigation of Sagger Clays: Some Observations as to the Significance of Their Thermal Expansions, II," *Jour. Amer. Ceram. Soc.*, **9** [9] 555–74 (1926)); and A. E. MacGee ("Some Physical Properties of Chemical Stoneware Bodies," *ibid.*, **10** [8] 569–78 (1927)).

(*B*) Translucency

The fundamentals of light measurements, including opacity (the reciprocal of translucency), are discussed fully by D. B. Judd in "Optical Specification of Light-Scattering Materials," *Jour. Research Nat. Bur. Standards*, **19** [3] 287–317 (1937); R.P. 1026.

The simplest method, which would give relative values suitable for control or comparison purposes, would be to use a light of predetermined intensity on one side of the specimen and an illumination meter on the other. A reference specimen could be used to adjust the distance of the light from the test piece to give comparable values.

Investigators interested in translucency measurements are also referred to (1) the Martens photometer described in *Physik. Z.*, **1**, 299 (1900); (2) the Lange reflectometer, the use of which is described by J. H. Koenig in "Physical Properties of Commercial Dinnerware," *Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 101 (May, 1939); (3) the Hunter reflectometer (R. S. Hunter, "A Multipurpose Photoelectric Reflectometer," *Jour. Research Nat. Bur. Standards*, **25** [5] 581–618 (1940); R.P. 1345); and (4) the methods used by F. C. Arrance in "Use of Photronic Cell and Spectrophotometer for Measuring Translucency of Whiteware," *Jour. Amer. Ceram. Soc.*, **25** [4] 116–22 (1942).

(*C*) Absorption (of Water)

This determination is essentially a measure of porosity.

(1) The simplest test is the penetration of a dye at atmospheric pressure, followed by visual examination.

(2) The dye test can be made more sensitive by using pressure. In the Story of Sillimanite Laboratory Ware (Central Scientific Company publication), the test described involves a pressure of 200 lb./sq. in. for 2 hr. The A.I.E.E. Proposed Standard 41A (1941) for insulator tests requires the application of 4000 lb./sq. in. for 15 hr., or of 10,000 lb./sq. in. for 6 hr.

(3) Boiling in water at atmospheric pressure. This test also is an arbitrary one, but it is simple, inexpensive, and satisfactory if its limitations are recognized. Federal Specification M–C–301 for Vitrified Chinaware requires boiling for 5 hr. and cooling to room temperature in 20 hr. The following values (average for 16 brands of semiporcelain tableware) show the water absorbed after various times of boiling, expressed in the percentage of the water absorbed after 240 hr. of boiling: 1 hr. (73%), 5 hr. (77%), 80 hr. (89%), and 120 hr. (94%).

The value of 77% after 5 hr. of boiling is the average of values ranging, with one exception, from about 70 to 80%. The exception was determined on specimens of an English ware which absorbed only about 1.5% of water during the 240 hr. of boiling; only 14% of this 1.5% was absorbed during the 5-hr. boiling. It cannot be assumed from this that the degree to which the end point is reached (i.e., the filling of all pores with water) is always directly related to the absorption. Values for specimens of 4 brands of tableware are as follows, where A is the percentage of water absorbed after 240 hr. of boiling and an additional 11 hr. of autoclaving at 150 lb./sq. in. and B is the percentage of filled pores based on total pore volume as calculated from bulk volume and true specific gravity:

Brand	A (%)	B (%)
14	7.4	89
15	10.2	80
8	10.2	79
2	12.2	81

(4) A more nearly complete filling of the pores may be expected if an autoclave treatment is substituted for boiling at atmospheric pressure. Values for specimens of 4 brands of ceramic whiteware are as follows, where C is the percentage of water absorbed during 5 hr. of boiling and D is the percentage of water absorbed during 5 hr. of autoclaving at 150 lb./sq. in. pressure:

	C (%)	D (%)	C/D (%)
Wall tile	13.8	13.9	0.99
Tableware A	13.0	14.3	0.91
" B	10.0	11.4	0.88
" C	5.6	6.8	0.82

(5) The gas expansion porosimeter is favored by many investigators because the determination is based on the expansion of the gas (air), under reduced pressure, in pores which would act as "closed pores" so far as penetration of a liquid is concerned. The values obtained are claimed to more nearly represent the "true pore volume" than values obtained with liquid penetration methods. Gas porosimeters are described by E. W. Washburn and E. N. Bunting in "Porosity: VII, the Determination of the Porosity of Highly Vitrified Bodies," *Jour. Amer. Ceram. Soc.*, **5** [8] 527–37 (1922), p. 528; by Louis Navias ("Metal Porosimeter for Determining Pore Volume of HighlyVitrified Ware," *ibid.*, **8** [12] 816–21 (1925)); and in A.S.T.M. Standards for 1936, Part II, p. 1189.

The gas porosimeter is especially suitable for tests of bodies with relatively few and very fine pores. In his report, Navias gives the following values:

	Pore volume (%)		
	100-hr. immersion in water with 1-hr. boil at 24-hr. intervals	Gas expansion porosimeter	
Body No.		(1)	(2)
190	0.12	0.37	0.62
191	.17	.35	.25
192	.17	.66	.52
193	.14	.58	.72
194	.17	.47	.42
195	.14	.46	.20

(*D*) Tensile Strength

The determination of this property, as applied to ceramic whiteware, has two serious drawbacks, namely, (1) it is necessary to manufacture specimens especially for the test and such specimens usually bear no resemblance in shape or cross section to the product represented, and (2) it is difficult to obtain satisfactory load distribution and, consequently, the desired type of rupture. The method for testing electrical porcelain, described in the *Journal of The American Ceramic Society* for June, 1928, is identical to the method described in A.S.T.M. Standard D116–39. An alternate method uses the so-called "figure 8 specimen," appropriate grips for which are described in Federal Specification SS–C–158A for Hydraulic Cements, and the setup for testing is illustrated by J. H. Koenig in *Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 101.

Properly made determinations of flexural strength may be used as measures of resistance to failure in tension. These determinations are recommended because of their greater economy, convenience, and reproducibility.

(*E*) Flexural Strength

This is often called "the modulus of rupture" or "the modulus of rupture in bending." Usually the specimen is

broken by applying a load at the midspan of a two-point support. If the span is at least five times the diameter of the specimen (or the depth, in rectangular cross sections), the stresses causing failure will be purely tensional. This presupposes that the stress is applied so as to avoid torsional and axial forces.

Specimens should be similar in size and shape to obtain comparable data. A discussion of the statistical theory of the effect of dimensions and of the loading method was presented by John Tucker, Jr., before the annual meeting of the American Society for Testing Materials in 1941. Especially prepared specimens should be pressed, molded, extruded, etc., by the same basic method as the product they represent. Some of the effects of forming methods on modulus of rupture are reported by R. F. Geller and A. S. Creamer in "Some Factors Affecting the Properties of Ceramic Talcose Whiteware," *Jour. Research Nat. Bur. Standards*, **26** [3] 213–26 (1941); R.P. 1371. For a number of reasons, extruded bars of round cross section are preferred to the rectangular type.

The specimens called for in A.S.T.M. Test Method for Electrical Porcelain D116–34T should be either longer or smaller in diameter to permit a larger span-depth ratio. The loading blocks are probably satisfactory. Loading devices suitable for whiteware tests more recently have been described by S. V. Forgue and G. A. Loomis in "Modulus of Elasticity of Dinnerware Bodies by the Sonic-Vibration Method," *Bull. Amer. Ceram. Soc.*, **20** [12] 425–30 (1941) and by R. F. Geller and A. S. Creamer in their research report No. 1371 mentioned in the foregoing paragraph.

(*F*) Compressive Strength

This is a relatively simple test, although the observance of certain precautions (as outlined in A.S.T.M. Test Method for Electrical Porcelain D116–34T) is imperative. Specimens representing products of relatively small cross section, as compared with high-tension insulators, need not (and preferably should not) be 1.125 in. long by 1.125 in. in diameter, but it would be well to maintain the same ratio of height to diameter. Also, specimens should be made by the same basic method as used in manufacturing the product they represent, and a round cross section is probably better than the rectangular type.

(*G*) Impact Strength

Impact testing machines of the pendulum type, such as are described by Botson and Hyde in Mechanical Testing (published by E. P. Dutton Co.), are not popular in the whiteware industry and probably richly deserve their unpopularity. They have been used and investigated at length in Germany. Otto Bartsch has published two articles with comprehensive bibliographies, namely, "True and Apparent Impact Strength," *Ber. Deut. Keram. Ges.*, **17** [6] 281–95 (1936) and "Impact Bending Strength of Ceramic Bodies and Glasses and Its Relationship to the Resistance to Thermal Shock of Fire-Clay Bodies," *ibid.*, **18** [11] 465–89 (1937). He shows that in machines of this type the difference between the energy gained by the pendulum during its fall (and that dissipated during its rise after breaking the specimen) is only an apparent or arbitrary measure of the resistance to impact and is often appreciably greater than the true resistance. A special adaptation of the pendulum impact machine is described in Federal Specification M–C–301 for Vitrified Chinaware. Although this test does not involve the error investigated by Bartsch, its results are purely arbitrary and hardly amenable to mathematical treatment.

The more common impact machine involves, in principle, the dropping of a weight upon the specimen, usually from a successively increased height, until failure occurs. About the simplest possible construction is that described by J. W. Koenig (*Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 101) and elaborations on this design can be built to suit the fancy of the investigator. In any model, the weight should be free falling and properly guided to assure repeated impacts at the same point, and the specimen should be held and supported solidly to avoid, insofar as possible, all nonreproducible stresses.

(*H*) Elasticity

The value for this property is customarily expressed as Young's modulus. It can be determined readily with the same apparatus used for modulus of rupture tests, with an additional provision for measuring deflection at the point of load application. The true deflection, of course, is the difference between the deflection at the load point and the support points. If the support points move downward measurably while the specimen is stressed, it will be necessary to have gauges at these points. For this work, gauges reading to 0.0001 inch are recommended. The span should also be at least 10 times the depth, or diameter, of the specimen.

(*I*) Heat Shock

The details of procedure in this test must, to a considerable extent, be determined by the type of product under test. If the high temperature is not above that of boiling water, the simplest method is to quench from a bath of hot water to one of cold water. Such a method is used in the high-tension insulator industry (A.I.E.E. proposed standard 41A and A.S.T.M. D116–39). If the test is above 100°C. (212°F.), the procedure is modified by heating in an oven and quenching to cold water.

"Quenching to running tap water" ordinarily describes a fairly constant and reproducible condition (15° to 20°C.), but quenching to circulated water containing ice is more specific. Or the ware may be quenched from an oven temperature of "$x°$ ± tap-water temperature" to "tap water." One tableware manufacturing plant uses "x = 200°C."

Many specimens must be tested, especially if the point of failure is judged by the appearance of crazing. Also, a procedure, once decided upon, should be followed in every detail. For example, plates may appear unaffected a few minutes after removal from the cold water, but will be crazed if they are inspected several hours later. Also, craze lines may not be detected by casual inspection. This is particularly true of colored glazes which may seem to be in perfect condition, even on careful survey, and yet are found to be badly crazed when a dye solution is applied to the surface. The specimens should be quenched into a dye solution.

For chemical porcelain, the British Standards Institute (Standard No. 914, 1940) specifies quenching from 240°C. to water at 15°C. (see *Ceram. Abs.*, **20** [1] 21 (1941)). In The Story of Sillimanite, referred to on p. 12, the test described involves heating dishes in the full flame of a Bunsen burner to maximum redness and then transferring them to a water-cooled metal surface, a drop in temperature of 750°C. or more for the lower part of the dish. This test seems more appropriate for chemical ware.

(*J*) Moisture Expansion

The test for this property is useful only for porous-bodied products such as earthenware and semiporcelain. It is designed to accelerate the body expansion which will inevitably take place in feldspathic compositions exposed to water or to water vapor, even in ware stored in rooms ordinarily thought of as "dry." The tests so far have been made in a steam "pressure cooker" or autoclave. The severity of the test varies according to the severity of the service conditions, but there is no logical basis upon which test conditions can be prescribed. H. H. Holscher presented some comparative service and autoclave-induced expansions in "Effects of Autoclave Treatment on Ceramic Bodies and Clays" in *Jour. Amer. Ceram. Soc.*, **14** [3] 207–18 (1931). Geller and Creamer ("Note on Moisture Expansion of Ceramic Whiteware in Storage and in Service," *ibid.*, **24** [3] 77–79 (1941)) recently obtained, with the cooperation of the industry, some data on the expansion which had taken place in wall-tile bodies stored for from 8 years to less than 1 year and in tableware which had been stored, or in use, for from 23 years to 2 years. Specimens were autoclaved, and the data showed (in every case but one in which the expansion was measurable) that even $^1/_2$-hr. autoclaving at 150 lb./sq. in. produced more expansion than had taken place in use or in storage. For example, a plate in domestic use for 23 years had expanded

0.03% during this time, whereas 1/2 hr. of autoclaving at 150 lb. produced an 0.10% expansion. A cup in domestic use for 8 years had expanded 0.03%; the autoclave produced an expansion of 0.07%.

Some plants and laboratories may find it inconvenient to use a pressure of 150 lb./sq. in. This is especially true if a lower pressure can be obtained by simply connecting to a steamline from the power plant. Or, if higher pressure is available, the time of test can properly be decreased. For information on the relative effects of time and of pressures see the articles previously referred to and C. C. Treischel's study of tile ("Moisture-Expansion Tests," *Ceram. Age*, **25** [2] 46–48 (Feb., 1935)) and J. H. Koenig's report on semivitreous ware ("Properties of Ware versus Thermal History: I, Test on Vitreous China Bodies and Ware," *Jour. Amer. Ceram. Soc.*, **25** [2] 33–40 (1942)). It should be remembered that the time involved in building up and in releasing the pressure will affect the results and should be specified.

If specimens are fairly large (measurements can be made over a length of 3 or 4 in.), the moisture expansion can be determined with a gauge or with calipers reading to 0.0001 in. For small specimens, the interferometer method developed by H. G. Schurecht ("Methods for Testing Crazing of Glazes Caused by Increase in Size of Ceramic Bodies," *Jour. Amer. Ceram. Soc.*, **11** [5] 271–77 (1928)) is recommended.

VIII. Glaze Tests

By R. F. Geller

(*B*) Chemical Durability

The question of how to test for glaze durability, with respect to chemical attack, is one for which no simple answer will suffice. The complexity of the problem is not so much how to test for a specific durability, but rather one of establishing which kind of durability will best indicate relative merits of glazes for a particular service.

Individual potteries may have accumulated histories of ware in actual service, which can be correlated with accelerated tests in the laboratory, but there appears to be nothing in the literature. So far as restaurant ware is concerned, the complete answer to glaze durability is not one simply of attack by food acids and detergents, but also of abrasion and cutlery markings on surfaces which have been roughened by chemical attack. The selection of a test, or tests, for tableware involves also the question of color durability. Although the growing use of underglaze decoration has lessened the importance of this phase, it undoubtedly is still a factor. The treating of chemical porcelain is more of a straightforward proposition, as the conditions of service involve, generally speaking, fewer variables.

The literature on the testing of tableware glazes has been rather thoroughly combed by J. H. Koenig ("Lead Frits and Fritted Glazes," *Ohio State Univ. Eng. Expt. Sta. Bull.*, No. 95, 116 pp. (July, 1937)). Probably as a result of this combing, he has adopted treatments with 4% acetic acid and 4% sodium hydroxide solutions at room temperature for 24 hr., 1 week, and 1 month. He reports results of the 24-hr. exposure. Either the tests are not sufficiently severe or the glazes were all of high durability, because in no case was an effect noted. Temperature is an important factor in these tests. At the National Bureau of Standards, Geller and Creamer found, in "Solubility of Colored Glazes in Organic Acids," *Jour. Research Nat. Bur. Standards*, **22** [4] 441–52 (1939); R.P. 1196, that pouring a boiling 5% solution of acetic acid in a dish and letting it stand for one-half hour would extract sufficient lead for tests of relative lead solubility. This test produced a marked change in the appearance of some highly colored glazes.

W. Steger in "Comparative Investigation of Earthenware Glazes," *Ber. Deut. Keram. Ges.*, **17** [5] 265–77 (1936) used hot 4% acetic acid for one-half hour. Another article in this same publication (H. Kohl, "Red and Yellow Colors in Ceramics: I, Red Colors," *Ber. Deut. Keram. Ges.*, **16** [4] 169–94 (1935); p. 180) recommends 3% HCl (cold) for 5 hr. and 1.0% NaOH (hot) for 1/2 hr., as a test of color stability. R. Rieke (*Ber. Deut. Keram. Ges.*, **11**, 487 (1930)) studied overglaze color durability by exposing glazes to 4% acetic acid for 24 hr. and 0.75% HCl for 2 hr. and for 5 hr., all at room temperature. W. Funk and M. Mields ("Resistance of Colored Enamels to Dilute Acids and a Process for the Determination of Their Lead Solubility," *Ber. Deut. Keram. Ges.*, **12** [11] 535–48 (1931)) used boiling 4% acetic acid for 1/2 hr. and also 3% HCl for 5 hr. at room temperature. Apparently all of these tests are severe enough to judge overglaze colors. One test can be chosen and, by using the same technique consistently, satisfactory comparisons can be obtained. K. Endell ("Effect of Alkaline Cleansing Materials on Color-Decorated Hotel Dinnerware," *Ber. Deut. Keram. Ges.*, **12** [11] 548–55 (1931)) attacked the problem in a more "practical" way. He subjected specimens to two 7-hr. tests. The reagent was a 0.25% solution of a commercial detergent used in dish-washing machines. The temperature of the first test was 40° to 50°C.; that of the second was from 80° to 90°C. The first temperature affected none of the specimens; the second affected all but two, which were the highest type on the market. As all of these tests were judged by their action on overglaze decoration, they add very little to our knowledge of appropriate tests for the glaze itself. Glazes on restaurant ware are probably damaged most by the injudicious use of washing compounds, and a test of the Endell type seems worthy of further trial.

High-tension insulator glazes must be as nearly perfect as possible. It seems logical, therefore, to assume that the maintainence of a high gloss on the glaze surface is important. Deposits of varying acidity or alkalinity may form upon and possibly attack the glaze if it is not properly formulated or matured. No insulator specifications, however (in this country at least), require a test for glaze durability. Perhaps the industry is satisfied to let sleeping dogs lie.

Chemical porcelain glaze tests have been devised and in some cases have found their way into specifications, e.g., the British Standards Institute Standard No. 914 (1940). The glaze is subjected for 4 hr. in a steam bath to (*a*) constant b.p. HCl, (*b*) a normal Na_2CO_3 solution, and (*c*) a 5% caustic soda solution. The specimens are then heated for 2 hr. at 950° to 1000°C. As a result of this treatment, the maximum loss (in mg./dm.^{2}) is for (*a*) 1 mg.; for (*b*) 10 mg.; and for (*c*) 60 mg.

Some tests described in *Bur. Stand. Tech. Paper*, No. 105, "Comparative Tests of Porcelain Laboratory Ware," by C. E. Waters, are probably worth considering, but improvements in laboratory porcelains during the past twenty-five years should show modern ware decidedly more resistant than ware in the articles reported on at that time. Also of potential interest are articles in (1) *Jour. Proc. Inst. Chem.*, **III**, p. 210 (1920); *Analyst*, **45**, 397 (1920); *Céramique*, **37**, 209 (1934); *Stavivo*, p. 301 (1932) (*Chem. Abs.*, **27**, 5165 (1933)); and *Keram. Rundschau*, **28**, 470 (1920) (*Chem. Abs.*, **15**, 424 (1921)).

FORTY-FIFTH ANNUAL MEETING, WEEK OF APRIL 18, PITTSBURGH, PA.

Forward-going aggressive ceramists succeed only by continuously studying, not narrowly, but broadly the current problems in all ceramic fields.

INSTITUTE OF CERAMIC ENGINEERS

President: H. M. KRANER, Bethlehem Steel Co., Bethlehem, Pa.
Vice-President: H. B. DUBOIS, Consolidated Feldspar Corp., Trenton, N. J.
Secretary: H. G. SCHURECHT, New York State College of Ceramics, Alfred, N. Y.
Past-President: E. H. FRITZ, Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
Trustee Representative: H. G. WOLFRAM, Porcelain Enamel & Mfg. Co., Baltimore, Md.

ANNUAL MEETING OF E.C.P.D.

The high lights of the annual meeting of the Engineers' Council for Professional Development held in New York, N. Y., October 17 and 18, insofar as ceramic engineers are concerned, were the accrediting of the Department of Ceramic Engineering at the Georgia School of Technology, Atlanta, Ga.,* and the presence for the first time of a ceramic engineer as a member of the Council.

The accrediting of the Department at Georgia Tech brings to ten the number of departments of ceramic engineering which have received the approval of the Council.

The following paragraph from the report of the American Institute of Mining and Metallurgical Engineers to the E.C.P.D. is worth recording as it shows the friendly attitude of one of the oldest of the national engineering societies toward the Institute:

"The A.I.M.M.E. has been instrumental in extending the influence of E.C.P.D. to a professional engineering society not yet directly represented on the Council. This was accomplished through the appointment in March, as one of the A.I.M.M.E. representatives, of A. F. Greaves-Walker, a recent past-president of the Institute of Ceramic Engineers and present chairman of the Mineral Industries Education Division of the A.I.M.M.E."

It is also worth reporting that one of the oldest and most prominent members of the Council remarked that "the ceramic engineers are the most professionally minded group of engineers in the country."

* See also "E.C.P.D. Recognizes Georgia Tech," *Bull. Amer. Ceram. Soc.*, **21** [12] 308–309 (1942).

PRODUCTION OF STONE, CLAY, AND GLASS PRODUCTS

Selective Service System Occupational Bulletin No. 34

(1) The War Manpower Commission has certified that the production of stone, clay, and glass products is an activity essential to the support of the war effort.

(2) This bulletin covers the following essential activities as listed in the amendment to Local Board Release No. 115: (*a*) *Production of stone, clay, and glass products:* Technical, scientific, and industrial pressed and blown ware; sand-lime brick, firebrick, and other heat-resisting clay products; lime; abrasive wheels, stones, paper, cloth, and related products; asbestos products, including steam and other packing, pipe, and boiler covering; crucibles and retorts; porcelain electrical supplies; and parts of military apparatus.

(3) The following list of occupations in the production of stone, clay, and glass products are occupations requiring a reasonable degree of training, qualification, or skill to perform the duties involved. It is the purpose of this list to set forth the important occupations in the production of stone, clay, and glass products which must be filled by persons capable of performing the duties involved, so that the activity may maintain efficient production. This list is confined to those occupations which require six months or more of training and preparation.

(4) In classifying registrants employed in these activities, consideration should be given to (*a*) the training, qualification, or skill required for the proper discharge of the duties involved in his occupation; (*b*) the training, qualification, or skill of the registrant to engage in his occupation; and (*c*) the availability of persons with his qualifications or skill, or who can be trained to his qualification, to replace the registrant and the time in which such replacement can be made.

—LEWIS B. HERSHEY, *Director*

CRITICAL OCCUPATIONS
Producton of Stone, Clay, and Glass Products

Accountant (cost)
Blacksmith (all-around)
Boilermaker
Carpenter (all-around)
Chemist
Clay molder
Deairing machine operator
Diemaker
Die repairman
Electrician
Engineer (powerhouse)
Engineer (professional and technical)
Foreman (includes foremen actually engaged in supervisory duties in connection with the production of stone, clay, and glass products who exercise independent judgment and assume extensive responsibility for the product. Does not include straw bosses or laboring gang foremen)
Glass blower
Glass furnaceman
Hydrator operator
Inspector (includes inspectors experienced in the methods of manufacture of stone, clay, and glass products who make examinations in any of various stages of manufacture to discover faulty material or workmanship)
Instrument repairman
Kiln firer
Lathe operator (pottery ware)
Machinist (all-around)
Manager (employment and personnel)
Manager (production)
Manager (traffic)
Mechanic (automotive)
Mechanic (maintenance)
Millman
Millwright
Mold maker
Molder (clay pottery)
(industrial and scientific ware)
Molder (hand)
(industrial and scientific ware)
Pipe fitter
Power shovel operator
Sheet metal worker (all-around)
Spearman
Spinner (asbestos)
Toolmaker
Welder (all-around)
Yardmaster

Knowledge Is Acquired by Communication

45th Annual Meeting, Week of April 18
Pittsburgh, Hotel William Penn

DEMAND AND SUPPLY OF CERAMIC ENGINEERING GRADUATES

Since January 1, 1942, the ceramic engineering departments of American universities have had 202 requests for graduates of which they were able to supply 53, indicating a shortage of 149.

NOTE: All requests have been catalogued, and where a request was made to several schools the duplication has been eliminated.

Industry	Men requested	Men supplied	Deficit
Abrasives	6	1	5
Alumina	11	3	8
Common brick	2	0	2
Cement	6	5	1
Colors	1	0	1
Crucibles	2	0	2
Cryolite	2	0	2
Dinnerware	7	2	5
Electrical porcelain	7	2	5
Enamels for metal	1	0	1
Fireproofing	1	0	1
Glass	18	6	12
Gypsum products	3	0	3
Machinery	2	0	2
Magnesium	5	2	3
Porcelains (special)	2	0	2
Pottery	5	1	4
Publications (technical)	2	0	2
Raw materials (miscellaneous)	4	3	1
Refractories (general)	29	8	21
Refractories (porous)	14	4	10
Steel	14	8	6
Research	32	5	27
Sanitary ware	5	0	5
Sewerpipe	4	1	3
Spark plugs	6	2	4
Steatite insulators	7	0	7
Tile	4	0	4
	202	53	149

In compiling this data on requests and placements, no record of men requested by or placed in Government bureaus is included.

If we eliminate common brick, colors, pottery, and tile, which may be considered to be unessential to the war effort, we still have 190 men requested, 52 men supplied, and a deficit of 138.

Of the students now enrolled in ceramic engineering schools,* there will be a maximum of 49 graduates available for industrial assignment in March, 1943, if no more of the present senior students are drafted or enlist.

At the end of 1943, when another class expects to be graduated, there will be 44 additional graduates available for industrial placement if no more of the present junior students are drafted or enlist.

Thus we find that during the coming year the ceramic schools of the United States cannot provide more than two-thirds of the demand for men now on file by industries doing war work. As demands for men are increasing each month, the situation promises to become increasingly difficult.

Respectfully submitted,

—ARTHUR S. WATTS, *Chairman, Subcommittee D of Special Committee on Status of Ceramic Engineers with Selective Service Boards, American Ceramic Society*

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* See also "Critical Shortage of Ceramic Technical Men," p. 293, November, 1942, *Bulletin*.

SALUTE TO JOSEPH J. CERMAK
SECRETARY, STRUCTURAL CLAY PRODUCTS INSTITUTE

Joseph J. Cermak, secretary of the Structural Clay Products Institute, Washington, D. C., recently celebrated his twentieth anniversary of association work in the structural clay products industry. Twelve of these years have been spent with the Hollow Building Tile Association (name changed to Structural Clay Tile Association in 1929) and two with Clay Industries, Inc. He has been with the Structural Clay Products Institute for the past six years.

Biography

Mr. Cermak was born in Chicago, Ill. After attending grade and high schools in Chicago, he received his degree in journalism from the University of Illinois in 1917.

In April of the same year, he entered the United States Army, where he was commissioned as a second lieutenant in the infantry. He was discharged in June, 1919.

From 1919 to 1922, Mr. Cermak was associated with the Illinois Bell Telephone Company and did special editorial work for the City News Bureau and for the Chicago newspapers.

He began his association work September 1, 1922, when he joined the Hollow Building Tile Association as director of service in charge of advertising, publications, and public relations. In October, 1932, he was elected secretary of this organization (now the Structural Clay Tile Association).

In November, 1934, Mr. Cermak was elected treasurer of Clay Industries, Inc., an organization which handled the Code Administration of the Clay Products Code under NRA.

Mr. Cermak has been ably serving the Structural Clay Products Institute as secretary and director of the Publications Department since November, 1936.

Joseph J. Cermak

RESOURCES *and* RESOURCEFULNESS
OPPORTUNITIES *and* OPPORTUNISM

Resources and Opportunities Are Nature's Gifts
But Each Must Be Developed

Resourcefulness Is a Personal Accomplishment
Had Only by Personal Opportunism

Procrastination Is the Thief of Resources and Opportunities

One Must Constantly Dig for Resources and
Be Alert for Opportunities

The American Ceramic Society, Inc.

Fosters Resourcefulness and Opportunism

The Essentials

For Personal Accomplishments in Ceramics

The following is the score of those who in 1942 have realized this opportunity to acquire more resourcefulness. They practice opportunism.

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
December 21, 1941	2029	257	37	609	220	3152
February 21, 1942	2083	255	34	605	220	3197
September 21, 1942	2002	261	20	449	220	2952
October 21, 1942	2031	268	21	450	220	2990
November 21, 1942	2062	267	15	438	220	3002
December 21, 1942	2088	270	15	446	220	3039

(1943)

NEW MEMBERS IN DECEMBER

Corporation

AMERICAN CRUCIBLE CO., R. E. Burdett (voter), Shelton, Conn.

MARSHALL-ECLIPSE DIVISION OF BENDIX AVIATION CORP., Furber Marshall (voter), Box 538, Troy, N. Y.

Personal

CARUTHERS, RAY G., Box 391, New Castle, Pa.; secretary, Universal Sanitary Mfg. Co.

*EGGLESTON, MYRON M., Universal Sanitary Mfg. Co., New Castle, Pa.; ceramic engineer.

FORD, JAMES W., 19 Doat St., Buffalo, N. Y.; associate physicist, Spencer Lens Co.

HEYTHUM, ANTONIN, Industrial Design Section, California Institute of Technology, Pasadena, Calif.; chairman of faculty, Industrial Design Section.

HOOVER, CHARLES H., 3413 Ramona Ave., Baltimore, Md.; technical advisor, General Refractories Co.

JACOBS, RICHARD A., Westinghouse Electric & Mfg. Co., Bloomfield, N. J.; engineer.

KIRSCH, ALPHONSE J., 90 Scottsville Rd., Rochester, N. Y.; ensign, United States Navy.

MCKEE, CAROLYN, R. D. 7, Mahoningtown, Pa.; ceramic draftsman, Universal Sanitary Mfg. Co.

MILLIGAN, CHESTER E., 4814 Loma Vista Ave., Los Angeles, Calif.; district manager, West Coast Div., Electro Refractories & Alloys Corp.

ROLPH, THOMAS W., Holophane Co., Inc., Newark, Ohio; vice-president (formerly in name of Samuel J. Harris).

SHANKS, J. KING, 110 S. E. Main St., Portland, Ore.; vice-president, Gladding, McBean & Co.

SMYTH, HAROLD T., Corhart Refractories Co., Louisville, Ky.; research physicist.

STROUP, PHILIP T., Box 772, New Kensington, Pa.; chief, Chemical Development Div., Aluminum Company of America.

WHITTAKER, CLYDE M., 203 Englewood Ave., New Castle, Pa.; vice-president and treasurer, Universal Sanitary Mfg. Co.

Student

University of Illinois: LESLIE W. SEIBERT.

University of Toronto: WILLIAM S. REDMAN AND JOHN H. REID.

MEMBERSHIP WORKERS' RECORD

Corporation

C. E. Curtis	1	M. W. E. Doyle	1

Personal

J. R. Beam	2	R. F. Evans	1
R. E. Birch	1	W. K. McAfee	2
H. T. Brown	1	P. E. Thornton	1
R. M. Campbell	1	L. J. Trostel	1
Office	4		

Student

C. G. Harman	1	R. J. Montgomery	2
		Grand Total	**19**

ROSTER CHANGES FOR DECEMBER†

BELL, JOHN W., c/o Palmatex Corp., Pinellas Park, Fla. (Washington, D. C.)

BOLZ, LEONARD H., 3902 Georgia Ave., Washington, D. C. (Vandalia, Mo.)

BROWN, HORACE T., 21 Park Dr., Fairmont, W. Va. (Vineland, N. J.)

CATON, ALBERT J., JR., 1338 Denver St., Boulder City, Nev. (Reno, Nev.)

CHESNY, H. H., 701 Thayer Ave., Los Angeles, Calif. (Cape May, N. J.)

COMMONS, CHARLES H., JR., 508 Belmont, Watertown, Mass. (West Hanover, Mass.)

CONNER, HARVEY, Box 42, Scio, N. Y. (Summerville, Pa.)

CRUCIANA, F. L., 327 10th Ave., New Brighton, Pa. (Monaca, Pa.)

DOWS, ROBERT H., 33 Washington St., Hornell, N. Y. (Emporium, Pa.)

FILIPPI, CHARLES R., 709 W. Ohio St., Urbana, Ill. (Chicago, Ill.)

FOSTER, ENSIGN H. B., JR., Bureau of Ships, Navy Dept., Washington, D. C. (Chicago, Ill.)

HELLMERS, HENRY T., 304 East 6th Ave., Lancaster, Ohio (Alexandria, Ind.)

HOWER, ROBERT S., R. D. 1, Osborn, Ohio (Pittsburgh, Pa.)

HOYT, PHILIP S., Van Horn, Texas (Franklin, N. C.)

JOHNSON, F. G., Messrs. Johnson Bros., 350 Fifth Ave., New York, N. Y. (Stoke-on-Trent, England)

KNAPP, JAMES L., 209 Reynolds Ave., Corning, N. Y. (Wellsboro, Pa.)

KOENIG, Lt. (j.g.) C. J., 4134 Westview Rd., Baltimore, Md. (Columbus, Ohio)

LAIRD, CLINTON N., 35 Violet Lane, Lansdowne, Pa. (Hong Kong, China)

LAWRENCE, WILLIS G., American Manganese Steel Co., Metallurgical Dept., Chicago Heights, Ill. (Suffern, N. Y.)

MONTGOMERY, EARLE T., 4828 Woodway Lane, N. W., Spring Valley, Washington, D. C. (Franklin, Ohio)

PACKMAN, WILLARD D., 515 W. Fourth Ave., Derry, Pa. (Bolivar, Pa.)

POOR, MARY ELEANOR, 28 West 53rd Terrace, Kansas City, Mo. (San Francisco, Calif.)

REARDON, LESLIE J., Case School of Applied Science, University Circle, Cleveland, Ohio (British West Indies)

SIEGWALD, CLYDE R., 119 Buchannon St., Apt. 1, Clarksburg, W. Va. (Cambridge, Ohio)

STEVENSON, JAMES K., JR., R.F.D., Mundelein, Ill. (Chicago, Ill.)

STRANGE, JOHN M., State Teachers College, Hays, Kans. (Sapulpa, Okla.)

TAILBY, ROLAND V., 127 N. Sixth Ave., Highland Park, N. J. (Keyport, N. J.)

THOR, MURNER E., 508 S. Serrano Ave., Los Angeles, Calif. (Santa Monica, Calif.)

ZABAWSKY, ZENO, 1321 K St., N. W., Washington, D. C. (Victor, N. Y.)

* Indicates former member of The Society rejoining.
† Address in parentheses is former address.

POSTWAR SECURITY IS ESSENTIAL

There Must Be No Slacking in Ceramic Research and Education

FORTY-FIFTH ANNUAL MEETING

AMERICAN CERAMIC SOCIETY with seven simultaneous Division meetings.
Week of April 18, 1943, Hotel William Penn, Pittsburgh, Pa.

MEMBERS IN SERVICE*

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list is probably not complete, and we would appreciate information on other members.

CHARLES H. COMMONS, JR., Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
ALLEN J. ERICKSON, University of Washington, Seattle, Wash.
CHARLES F. HANKS, JR., Westinghouse Electric & Mfg. Co., Emeryville, Calif.
ROBERT S. HOWER, Harbison-Walker Refractories Co., Pittsburgh, Pa.
ALPHONSE J. KIRSCH, Alfred University, Alfred, N. Y.
VIRGIL J. LEE, University of Kansas, Lawrence, Kans.
GEORGE J. MORRIS, Harbison-Walker Refractories Co., Sykesville, Pa.
RALPH ROSE, Ohio State University, Columbus, Ohio.
CARL WEST, JR., Norton Company, Worcester, Mass.

* Published monthly, beginning with the September, 1942, *Bulletin*.

ERRATA: The name of Michael W. E. Doyle was added by mistake to the Service Roster for November. Mr. Doyle is not in active military service but is serving on the home front as a member of the staff of the Marshall-Eclipse Division of the Bendix Aviation Corp., Troy, N. Y.

PERSONAL NOTES

ADRIAN G. ALLISON

Adrian G. Allison, former ceramic engineer at the Electro Refractories & Alloys Corp., Buffalo, N. Y., has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to its Division of Ceramic Research.

Mr. Allison, who holds Bachelor of Ceramic Engineering and Master of Science degrees from Ohio State University, will be engaged in a program of research in the development of new manufacturing methods for the ceramic industry.

Adrian G. Allison

A specialist in refractories and plant engineering, he was ceramic engineer for the Charles Taylor Sons Co., Cincinnati, Ohio, subsequent to his position with the Electro Refractories & Alloys Corp. He is a member of Keramos and Tau Beta Pi.

JOSEF M. ROBITSCHEK

Josef M. Robitschek has been appointed director of ceramic research for the United States Stoneware Co., New York, N. Y., manufacturers of chemical stoneware and refractories. Dr. Robitschek will make his headquarters in Tallmadge, Ohio.

Biography

Dr. Robitschek was born at Pacov, Czechoslovakia, November 19, 1901. He was graduated from Prague University, Division of Chemistry, with the degree of engineer of chemistry in 1923.

Industrial Employment

Dr. Robitschek's first industrial position was as chemical engineer in the laboratory of the M. Montan and Industrielwerke, a plate-glass plant at Dolm Rychnov, CSR. He became interested in research on glasshouse refractories, a problem of vital importance to the Czechoslovak plate-glass industry, which had introduced the Fourcault process and had encountered considerable difficulties with tank blocks.

In 1924, Dr. Robitschek, charged to install a laboratory for research on ceramics for the ceramic plants of this Company, went to Germany to study the methods and organization of the Chemisches Laboratorium für Tonindustrie und Tonindustrie-Zeitung, Berlin, and of the laboratories of the most important refractories manufacturers. From 1924 to 1927, he was chief of the ceramic research laboratory of the M. Montan and Industrielwerke at Kaznejov, CSR.

In 1928, he was again sent to study production methods, chiefly in Germany and other European countries, and undertook the reorganization of this Company's refractories, chemical stoneware, and sewer-pipe plants, first as assistant plant manager and later as manager of these plants (from 1932 to 1939).

Dr. Robitschek left Czechoslovakia in 1939 to reorganize

the refractories plants of M. R. Amand & Cie. at Baudour and Tertre, Belgium, and to start the manufacture of chemical stoneware.

He fled from Belgium during the Nazi occupation and became technical manager for M. J. B. Fouchon-Baudot, Paray-le-Monial, France, producers of refractories, acid-proof brick, and tile and paving brick. He was also consulting ceramist for Les Produits Siliceux, S. A. Bufancais, France.

Dr. Robitschek came to the United States in July, 1942.

Other Ceramic Activities

Dr. Robitschek was awarded the title of doctor of technical sciences by Prague University in 1928 for the publication of a complete monograph on boiler-furnace settings and action of slags on boiler-furnace refractories.

He is a member of the Board of Trustees of the Czechoslovak Ceramic Society; vice-president of the Scientific Advisory Committee of the Association of Czechoslovak Ceramic Industries; and an active member of the Committee on Refractories, Chemical Stoneware, and Sewer Pipe of the Czechoslovak Standards Association and of the Committee on Refractories and Committee on Ceramic Literature of the Czechoslovak Ceramic Society.

Dr. Robitschek is also a member of The American Ceramic Society.

Publications

(1) "Simple Apparatus for Determination of Porosity of Refractory Material," *Tonind.-Ztg.*, **51** [51] 907–908 (1927).

(2) "Chemical Analysis of Silicates," *ibid.*, [63] pp. 1112–15.

(3) (With Franz Kanhäuser) "Load Deformation Test for Firebrick," *Sprechsaal*, **60** [38] 685–88 (1927).

(4) (With Franz Kanhäuser) "Refractories for the Glass Industry," *Tonind.-Ztg.*, **52** [92] 1840–42; [93] 1858–61; [94] 1881–83 (1928).

(5) Studies on Action of Coal Ashes on Boiler Settings. J. Miller and Co., Coburg, Germany, 1928. 196 pp.

(6) "Simple Method for Determination of Porosity of Refractories," *Ukrainsky Silikaty*, No. 11–12, pp. 484–85 (1928).

(7) "Use of 8-Hydroxyquinoline for Chemical Analysis of Silicates," *Jour. Amer. Ceram. Soc.*, **11** [7] 589–94 (1928).

(8) "Hydrogen-Ion Concentration of Ceramic Bodies," *Keram. Rundschau*, 1929.

(9) "A New Refractory Material," *Allgemaine Glas-Keram.-Ind.*, **1**, 6–9 (1930).

(10) "An Up-to-Date Firebrick Plant," *Trans. Czechoslovak Ceram. Soc.*, **7** [1–2] 57–67 (1930).

(11) "Heat Distribution and Consumption in One-Chamber Kilns," *Sprechsaal*, **63** [19] 345–47; [20] 361–63 (1930).

(12) "Cupola Linings," *Refrac. Jour.*, **7** [7] 364 (1931).

(13) "Statistics and Ceramic Research," *Trans. Czechoslovak Ceram. Soc.*, **8** [2] 120–27 (1931).

(14) "Refractories for the Iron Foundry," *Strojn. Obf.*, **13**, pp. 370–79 (1931).

(15) "Firebrick," *Angew. Chem.*, **45** [39] 621 (1932).

(16) "Grog Brick," *Fuerfest*, **8** [6] 98 (1932).

(17) "Refractories for Cupola Furnaces," *Trans. Internat. Foundrymen's Assn.* [Prague], pp. 385–98 (1934).

(18) "Refractory Cements," *Erde & Stein*, **5** [11] 161–63 (1937).

(19) "Chemical Stoneware," *Chem. Obzor*, **12**, 257–59 (1937).

(20) (With B. Helan) "Insulating Refractories," *Schweiz. Tonwaren-Ind.*, **41** [6] 3–4 (1938).

(21) (With B. Helan) "Insulation of Rotary Cement Kilns," *Stavivo*, **20**, pp. 104–109 (1939).

(22) (With Felix Singer) "Insulation of Arches of Open-Hearth Furnaces," *Rev. Universelle Mines*, **15**, 21–29 (1939).

(23) (With Felix Singer) "Special Brick Necessary in Wartime: III, Chromite Refractories," *Brit. Clayworker*, **43** [573] 310–14 (1940); "IV, Chrome-Magnesite Refractories," *ibid.*, pp. 333–38.

CERAMIC SCHOOL NOTES

CHRISTIAN PETERSEN EXHIBIT AT IOWA STATE COLLEGE

An exhibition of the work of Christian Petersen, Iowa State College sculptor, was held in Memorial Union on the College campus from November 26 to December 12.

A nearly completed patriotic statue appeared in the exhibition. It is to stand in the center of Gold Star Hall, the room in Memorial Union dedicated to American soldiers and sailors who have died in the defense of their country.

Mr. Petersen went to Iowa State College eight years ago to decorate the new Dairy Industry Building. After the completion of the commission, the College engaged him as artist-in-residence and teacher of sculpture.

His sculpture on the Iowa State College campus, which includes a group of figures of Indian women that decorates the Memorial Union fountain; a children's pool near the Home Economics building; and decorations in the Veterinary and Dairy Industry courts, has attracted widespread interest and favorable comment by art critics. He also has made sculpture portraits of prominent persons in Iowa, relief studies of children, and statues which symbolize the artist's reaction to life in the Middle West.

UNIVERSITY OF TEXAS

The first meeting of the recently organized Student Branch at the University of Texas was held November 9, 1942. Its new president, Bruce Blount, presided, and the members attended one hundred per cent.

The feature of the meeting was a lecture by Fred R. Bullard, professor of geology and mineralogy, who discussed the geology of clay minerals, particularly as applied to Texas. His lecture was illustrated by the petrographic examination of typical clay minerals, which was facilitated by a microprojector which reflected the slides on the screen. The various stages in the weathering of volcanic ash were particularly striking.

The second meeting of the Student Branch was held December 8. An address was given by Charles Umlauf, instructor of ceramic art in the Art Department at the University of Texas. Mr. Umlauf traced the development of ceramic art from early times to the present and illustrated his talk with a complete array of plain and colored slides.

Following his talk, a charter was presented to the Student Branch by Forrest K. Pence, associate director for ceramics and councillor for the group. The charter was accepted with appropriate remarks by the president, Bruce Blount. (A list of the other charter members was published in the December *Bulletin* on p. 309.)

A program of cooperation between the Art Department and the Ceramics Division of the Bureau of Industrial Chemistry created a great deal of enthusiasm.

UNIVERSITY OF ILLINOIS

Student Branch

The regular meeting of the University of Illinois Student Branch was held November 3, 1942. An interesting discussion of "How the Enameler Is Meeting War Demands" was presented by Charles S. Pearce, Secretary of the

Porcelain Enamel Institute, Washington, D. C. He also predicted some future possibilities of this industry.

The annual Pig Roast was held December 10, 1942, and featured a "grab-bag" Christmas party as a finale to the informal jests between seniors and professors. Members of the Arrangements Committee were Ray Davies, *Chairman;* Eugene Lynch, chairman of the Favors Committee; Bill Prentice; and Gordon Johnson.

Keramos

The Illinois Chapter of Keramos opened its year's activities with a pledge smoker on October 28 in the Illini Union Building. R. K. Hursh, Chapter Advisor, gave a talk on "The History and Meaning of Keramos Fraternity." The previously elected officers for the semester were announced as follows: *President,* EARL SMITH; *Vice-President,* VAUGHN SIETZINGER; *Secretary-Treasurer,* CHARLES L. TURNER; and *Herald,* FRANCIS WRIGHT. The program was concluded with an entertaining quiz program in which the faculty members and seniors competed.

On November 24, the Chapter formally initiated the following neophytes into membership: F. A. Petersen, M.S., special research associate, Department of Ceramic Engineering; C. R. Filippi, B.S., assistant, Department of Ceramic Engineering; F. Payson Shonkwiler and Ray Davies, seniors; and W. J. Prentice, J. D. Peterson, J. M. Durrant, and M. Klimboff, juniors. A. I. Andrews, Grand Vice-President, congratulated and welcomed the new members into the fraternity. A Keramos dinner is to be held at a future date in honor of the new pledges and the graduating seniors.

News of Graduates

R. E. Reif, Cer. '24, who has been with the F. E. Schundler & Co., Inc., with headquarters at Dover, Ohio, has recently accepted a position as ceramic engineer in charge of production with the R. Thomas & Sons Co., manufacturers of electrical porcelain, in Lisbon, Ohio.

Lieutenant (j.g.) W. D. Fitzpatrick, Cer. Eng. '41, visited the Department in October while on his way to San Francisco for service with the fleet. He was stationed formerly at Newport News, Va., where he supervised the installation of gun batteries on merchant ships.

Lieutenant L. D. Perry, Cer. Eng. '39, stopped in at the Department and told about several interesting and hair-raising experiences he has had as pilot of a transport plane across Africa and in Burma and India.

Second Lieutenant R. F. Kimpel, Cer. '41, also visited the Department. He is stationed with the 11th Coast Artillery of the Harbor Defense on Long Island Sound.

Word also has been received from Lt. M. E. Nelson, stationed with the 64th Bombardier Squadron in Australia, who has been piloting one of the Flying Fortresses; 2d Lt. F. Kagan, Cer. '42, with the 329th Bombardier Squadron in England; Lt. M. Flora, with the Field Artillery unit in England; and Capt. C. W. Henson, Cer. Eng. '33, who is also in Australia.

D. W. KOCHER AT PENN STATE

Daniel W. Kocher has been appointed assistant professor and supervisor of ceramic extension at Pennsylvania State College, State College, Pa., to succeed Edward P. McNamara, who recently resigned to join the staff of the Ceramic Department at Rutgers Univ., New Brunswick, N. J.*

Mr. Kocher, a graduate of the New York State College of Ceramics, Alfred, N. Y., in 1937, has been employed continuously since graduation by the North American Refractories Company, where he worked in both the Mount Union plant and the Lock Haven laboratory. He is experienced in every department of the manufacture of refractories, including research and development. In his present position, he will be directly in charge of the organization and supervision of the regular College extension classes in ceramics and will be key supervisor of all E.S.-M.W.T. classes in that field.

Mr. Kocher has been a member of The American Ceramic Society since 1938.

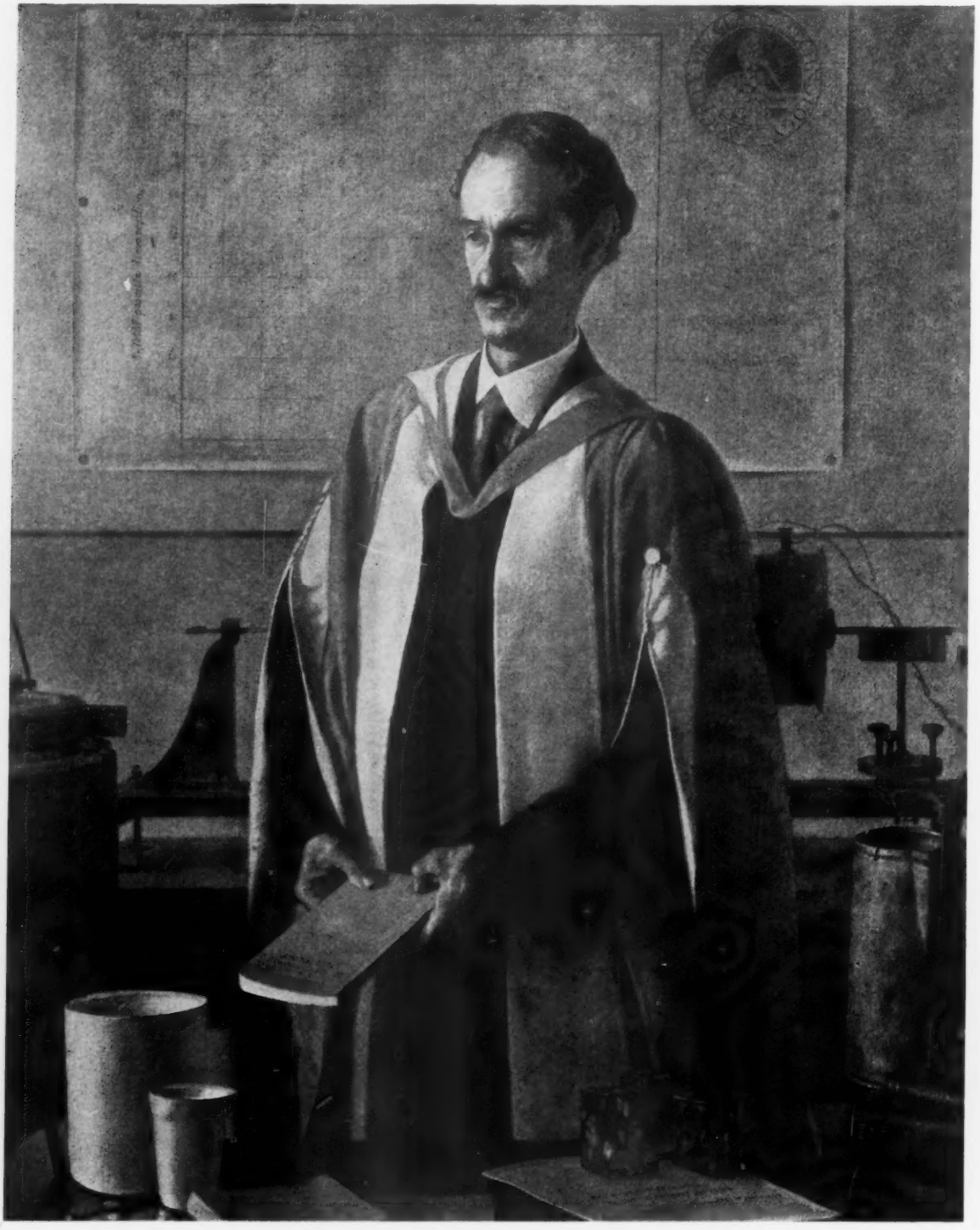
* A biographical sketch of Professor McNamara was published in *Bull. Amer. Ceram. Soc.*, **19** [3] 115 (1940).

MISSOURI SCHOOL OF MINES AND METALLURGY

On December 14, 1942, the Student Branch of the Missouri School of Mines and Metallurgy, Rolla, Mo., elected the following officers for 1943: *President,* GLENN H. LUFCY; *Vice-President,* MATTHEW KERPER; *Treasurer,* PAUL H. STOVESLAND; and *Secretary,* FREDERICK G. MERTENS.

—FREDERICK G. MERTENS, *Secretary*

Daniel W. Kocher



William Ernest Stephen Turner

To

The Society of Glass Technology

Greetings

The color replica of the portrait of

Professor William Ernest Stephen Turner

O.B.E., D.Sc., M.Sc., F.R.S., F. Inst. P., F.S.G.T., F. Amer. Ceram. Soc.,

the gift of the Society of Glass Technology, was formally presented to the American Fellows of The Society of Glass Technology and by them to the Glass Division of The American Ceramic Society at the Absecon Meeting, September, 1942.

It is the likeness of a man whose warm friendship we value and whom we honor and respect as the outstanding leader, internationally, in glass research, and as the creator of volumes of glass technology fundamentals.

Therefore, be it resolved, that this portrait be gratefully accepted, and that it be installed in the Executive Offices of The American Ceramic Society as a continual stimulus to our own efforts and as a symbol of our fellowship with our British colleagues.

Engrossed and signed in the names of

Henry Hess Blau, — Frederick Carder,
William Merritt Clark, — Arthur Louis Day,
Francis Charles Flint, — Chauncey Earl Frazier,
John Clyde Hostetter, — Jesse Talbot Littleton,
George Washington Morey, Ross Coffin Purdy,
Samuel Ray Scholes, — Alexander Silverman,
Eugene Cornelius Sullivan, William Chittenden Taylor,
Edwin Ward Tillotson, — Arthur Quincy Tool, —
U.S.A. Fellows of The Society of Glass Technology.

For the Glass Division
William C. Taylor
Chairman
Samuel R. Scholes
Secretary

For The American Ceramic Society
President
M. E. Holmes
Vice President

NECROLOGY

GEORGE MATTHEW VERITY*

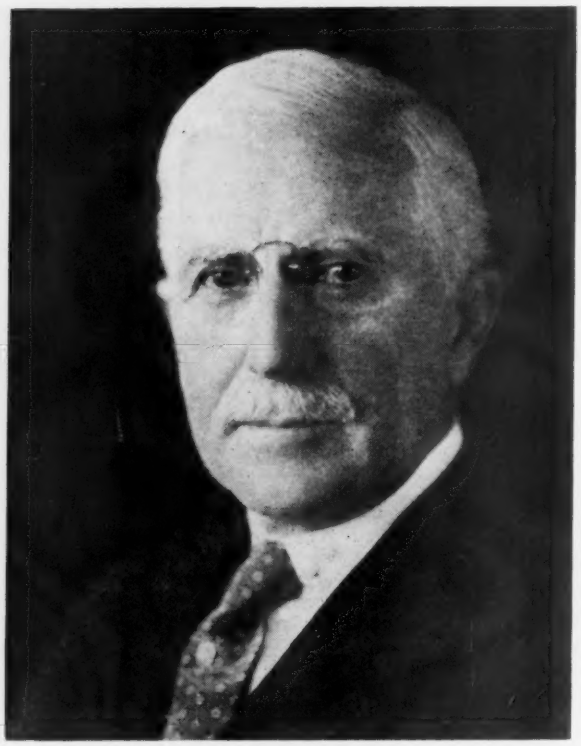
George Mathew Verity, founder of the American Rolling Mill Company, died at his home in Middletown, Ohio, November 6, at the age of seventy-seven, thirty-six hours after he was stricken with a heart attack.

His passing took from the American scene a zealous exponent of practical industrial democracy.

To him the industrial development of America and the improvement of relations between men and management were synonymous.

Beginning life as the son of a circuit-riding Methodist minister, Mr. Verity became one of the outstanding industrial leaders in America and the dean of all present-day steel executives. He entered the steel business in 1889.

Mr. Verity organized the American Rolling Mill Company in 1899, and under his leadership it became one of the largest steel manufacturing companies in the world. He saw the Company grow from one small plant, employing 350 men, to a world-wide institution employing many thousands.



George Matthew Verity

From the very beginning of his career, Mr. Verity pinned his faith to men, and he early introduced policies governing employer-employee relationships which emphasized square dealing and Christian principles in all phases of business. His vision encompassed not only the introduction of such policies in industry, but cooperation with the communities in which Armco plants were located to attain the highest possible standards in industrial and community life.

When he organized the American Rolling Mill Company, he made cooperation and understanding the basis of all its human relationships. He was the first to introduce in the steel industry such innovations as mutual benefit associations, group life insurance, a liberal wage policy, the eight-hour day in departments operating around the clock, and many other things which are a standard part of industrial relationships today.

Biography

George M. Verity was born April 22, 1865, at East Liberty, Ohio. He was the son of the Reverend Jonathan and Mary Verity.

His mother died when he was very young.

As a boy, Mr. Verity lived in a number of Ohio communities. He was graduated from the Georgetown, Ohio, High School. He never attended college but did take a commercial course in a Cincinnati business college. In 1886, he became manager of the W. C. Standish Wholesale Grocery Company in Cincinnati.

His entrance into the steel industry came in 1889, when he was asked to take over the management of the Sagendorf Iron Roofing and Corrugating Company in Cincinnati. His management proved so successful that this Company, which was located on the river front, was reorganized in 1891 as the American Steel Roofing Company. Mr. Verity was elected vice-president and general manager of the reorganized company.

It was while in this capacity that Mr. Verity decided to organize a company to manufacture iron and steel sheets. In 1899, the American Rolling Mill Company was incorporated, and Middletown was selected as the site of its first plant.

At the first meeting of the Armco Board of Directors held January 5, 1900, Mr. Verity was elected president and general manager. He remained president of Armco until January 8, 1930, when he was elected chairman of the Board of Directors.

Mr. Verity was an honorary vice-president of the American Iron and Steel Institute and a director of the Westinghouse Electric & Mfg. Co., the Cincinnati Branch of the Federal Reserve Bank, the Fifth-Third Trust Company of Cincinnati, and of Middletown Banks. He was also a member of the advisory committee of the National Industrial Conference Board, New York, N. Y., and a member of the Ohio Society of New York.

Surviving are his widow, Mrs. Jean Standish Verity; a son Calvin, executive vice-president and general manager of Armco; and two daughters, Mrs. Charles R. Hook, wife of Armco's president, and Mrs. Newman Ebersole.

* From *The Enamelist*, **20** [2] 20, 22 (Nov., 1942).

CHARLES ARNOLD UNDERWOOD

Charles Arnold Underwood, sales representative in the Boston district for the Babcock & Wilcox Company, died August 30, 1942, at Winchester, Mass.

Born at Newport, R. I., September 18, 1890, Mr. Underwood attended the Rogers High School in Newport and was graduated in 1915 from the Worcester Polytechnic Institute, Worcester, Mass., where he majored in chemistry.

His first employment was as chemist for the Harbison-Walker Refractories Company. In 1919, he became chief chemist for the American Refractories Company, and four years later sales engineer for the Queen's Run Refractories Co., Boston, Mass. He became associated with the Babcock & Wilcox Company in 1929.

Mr. Underwood was the author of two articles: "Analysis of Refractories," *Jour. Amer. Ceram. Soc.*, **6** [6] 1263–67 (1923) and "Service Life and Economy of Insulating Firebrick," *Brick & Clay Record*, **92** [5] 34–42 (1938).

He had been a member of The American Ceramic Society since 1922.

WILLIAM J. REA

William J. Rea, retired superintendent of the Buffalo Pottery Co., Buffalo, N. Y., died November 10, 1942, following a short illness. He was seventy-eight years old.

Born in Petersville, Pa., Mr. Rea was educated in Beaver Falls, Pa. After serving his apprenticeship as a potter with the Mayer China Company in Beaver Falls, he managed a pottery in Tiffin, Ohio, and later was manager of the Trenton Potteries Co., Trenton, N. J., for ten years.

In 1901, Mr. Rea went to Buffalo, where he organized the Buffalo Pottery Company. In 1904, the Company began to manufacture china, and in 1905 Mr. Rea successfully produced Old Willow pottery which previously was made only in England. He also originated the Del-Dare ware, an achievement regarded as outstanding in the pottery field. Mr. Rea remained as superintendent of the Buffalo Pottery Company for twenty-four years.

He had been long active in Buffalo Masonic circles.

Mr. Rea is survived by three nieces. His wife, Cleora Lewis Rea, died in 1930.

He was a member of The American Ceramic Society for ten years—from 1920 to 1930.

William J. Rea

Editorial from the South Buffalo News of November 12

In the fullness of years and holding the affectionate esteem of all who knew him, William J. Rea died Tuesday morning in his home, 2247 Seneca Street. Mr. Rea came among us many years ago. He was the type of man who helped make South Buffalo a community of friendly neighbors. He was in every respect a good man. He was honest in thought as well as deed. He was conscientious, straight-forward, and of sterling integrity. And to these virtues may we add one more. His was a kindly nature that manifested itself in all his relations with his fellowmen. We mourn his passing as that of a dear friend. We shall see and hear him no more in this world. But the memory of his sweet and lovable life will ever remain fresh and fragrant in our hearts.

ROBERT LINTON

Robert Linton, consulting engineer of Los Angeles, Calif., and Fellow of The American Ceramic Society, died November 12, 1942.

Although Dr. Linton had been in ill health for some time, he had spent long hours up to the last in unrewarded efforts for his government and the miners. He was consultant for the Los Angeles area on the Metals Reserve Board and did invaluable research work and compilation of data to aid the war effort in the field of mining. He lived modestly and quietly, accepting little for himself and giving all that he had. His memory will never cease to inspire those who knew him, but the loss to those he might have influenced in the future and the loss of the material help at this time is a terrible blow.*

Robert Linton

* A biographical sketch of Dr. Linton was published on page 37 of the January, 1938, *Bulletin* at the time the honorary degree of Doctor of Science was conferred upon him by Washington and Jefferson College, his alma mater.

CHARLES J. GILL*

Charles J. Gill, president of the Gill Clay Pot Company and dean of the glass refractories manufacturing business, died at his home in Muncie, Ind., November 12, 1942. During his long association with the glass and refractories manufacturing industries, he became widely known and highly respected by all those with whom he came in contact.

Mr. Gill was born in Wheeling, W. Va., May 11, 1853. During the early part of his life, he was connected with several glass manufacturing firms, among which were the Belmont Glass Co., Bellaire, Ohio; the Elson Glass Co., Martins Ferry, Ohio; the Beatty-Brady Glass Co., Dunkirk, Ind., now the Indiana Glass Co.; and the Crystal Glass Co., Bridgeport, Ohio. Later on, he was on the road for some time for a western Pennsylvania glass company.

The Gill Clay Pot Company was organized as James S. Gill & Sons at Bellaire, Ohio, in 1882. Shortly thereafter, it became Gill Brothers. In 1892, the factory was moved to Muncie, Ind., where it has since been in operation. Three brothers, William, Harry, and Frank Gill, with their nephew, Charles O. Grafton, conducted the business. Charles J. Gill did not take an active part in the Company until 1907, when he moved to Muncie. The Gill Clay Pot Company was incorporated in 1908 with Charles J. Gill as its president, an office he held until the time of his death. The interests of the other brothers in the Company were purchased by Mr. Gill and Charles O. Grafton and conducted thereafter by them until the death of Mr. Grafton in 1939. John H. Gill, a son of the deceased, is secretary and general manager of the Gill Clay Pot Company.

* From *National Glass Budget*, **58** [30] 7 (1942).

JOHN H. McKELVEY

John H. McKelvey, vice-president of the Laclede-Christy Clay Products Co., St. Louis, Mo., died suddenly of a heart attack while attending a meeting of the Laclede-Christy Board of Directors on December 16, 1942.

Mr. McKelvey was born at Kirkwood, Mo., April 3, 1881, and lived his entire life in that city. He started working as a telephone boy for the Christy Fire Brick Company, which later merged with the Laclede Fire Brick Company in 1907 to become the present Laclede-Christy Clay Products Company. At the time of the merger, he became connected with the Sales Department. In 1911, he was made assistant manager of the Glass Industry Division and nine months later was promoted to manager. During 1917, Mr. McKelvey accepted the position of general sales manager, the position he held until becoming vice-president of the Company on June 1, 1926.

He was a member of the Scottish Rite and Shrine, Rotary Club, and the Missouri Athletic Club. He was also a member of the Board of Trustees of the First Presbyterian Church of Kirkwood and a director of the Kirkwood Building and Loan Association.

Mr. McKelvey is survived by his widow and one daughter, Miss Margaret E. McKelvey.

HARRISON ESTELL HOWE

Harrison Estell Howe, editor of *Industrial and Engineering Chemistry* and *Chemical and Engineering News* of the American Chemical Society, died at his home in Washington, D. C., December 10, 1942.

Biography

Dr. Howe was born in Georgetown, Ky., December 15, 1881, the son of William James and Mary Scott Howe.

Following his graduation from Earlham College, Richmond, Ind., in 1901, with the B.S. degree, Dr. Howe attended the University of Michigan, Ann Arbor, Mich., for one year (1901–1902) and later received the M.Sc. degree from the University of Rochester, Rochester, N. Y., in 1913 and the D.Sc. degree in 1927. He was also the recipient of the degree of LL.D. from Southern College, Lakeland, Fla., in 1934, and of the degree of D.Eng. from Rose Polytechnic Institute, Terre Haute, Ind., in 1936, and from the South Dakota State School of Mines, Rapid City, S. Dak., in 1939. Dr. Howe was also honored by receiving the decoration of officer of Crown of Italy in 1926.

Before becoming associated with *Industrial and Engineering Chemistry*, December 1, 1921, Dr. Howe served as chemist with the Sanilac Sugar Refining Co., Croswell, Mich., 1902–1904; chemist, office manager, and editor, Bausch & Lomb Optical Co., Rochester, N. Y., 1904–1916; chemical engineer, Arthur D. Little, Inc., Boston, Mass., 1916; assistant to president, Arthur D. Little, Ltd., Montreal, Canada, 1916–1917; manager, Commercial Dept., Arthur D. Little, Inc., Cambridge, Mass., 1917–1919; and chairman, Division of Research Extension, National Research Council, 1919–1922.

A leader in organizing industrial groups for research, Dr. Howe served as trustee of Science Service; as chairman of the Chemicals Group and of the Chemicals Priority Committee, Priorities Division, Office of Production Management, from February to July, 1941; as chairman of the Advisory Committee, Chemical Section, OPM; and as consulting chemist for the Nitrate Division, Ordnance Bureau, U. S. Army, during World War I (also colonel, R.O.C. and C.W.S.).

Dr. Howe was a Fellow of the American Association for the Advancement of Science and a member of the American Chemical Society, the American Institute of Chemical Engineers (director and its representative in the American Engineering Council, 1921–1932), and the American Engineering Council (treasurer, 1923–1930). From 1926 to 1929, he served as round-table and general conference leader of the Institute of Politics, Williamstown, Mass. He was also a member of the Cosmos, Rotary, Torch, and Chemists' Clubs (New York) and of the Masons.

Dr. Howe is survived by his widow and two daughters.

Publications

Dr. Howe contributed numerous articles to scientific journals, a partial list of which is given as follows:

(1) New Stone Age. Century Co., New York, N. Y., 1921. 289 pp.

(2) "Research, an Industrial Investment," *Jour. Amer. Leather Chem. Assn.*, **18**, 465–75 (1923).

(3) "Scientific Research as an Association Activity" (Editorial), *Bull. Amer. Ceram. Soc.*, **3** [6] 209–21 (1924).

(4) Profitable Science in Industry. 1924.

(5) Chemistry in the World's Work. 1926.

(6) (With F. M. Turner) Chemistry in the Home. 1927.

(7) (With E. M. Patch) A series of six Nature and Science Readers.

He was also editor of *Chemistry in Industry*, Vols. I and II, in 1924 and 1925.

Award of Chemical Industry Medal for 1942 to Harrison E. Howe*

Harrison Estell Howe, honored by the award of the Chemical Industry Medal for 1942, has for a score of years guided the destiny of *Industrial and Engineering Chemistry* through a period of enormous fecundity of industrial research. The medal, given annually "to a person making a valuable application of chemical research" by the Society of Chemical Industry, will be presented to Dr. Howe on November 6. His function has been that of guide, philosopher, and friend to industry on the one hand and to research on the other. To each he has interpreted the other in a way to foster mutual confidence and cooperation.

Editors generally content themselves with the printed word alone as their medium of expression and make for themselves a kind of secluded cloister behind their pages. That could never content Dr. Howe. His boundless humanity has required personal contacts, multitudes of them, to give it scope. Thus one finds him a member by appointment, ex officio, or by special invitation of committees by the score. These duties for and to applied chemistry are so much a part of the man that he is constantly taking on new commissions. In all, his vigorous imagination, his kindly humanity, and his huge capacity for work have combined to make him one of the best-loved and most respected figures in American chemistry to-day.

Harrison Estell Howe

Primarily Dr. Howe's activities have been connected with the American Chemical Society, to which he has given much. But the National Research Council, Science Service, and the Chemical Warfare Service too have drawn heavily upon him, as have many, many others.

As if his activities in and for chemistry and research were not enough, Dr. Howe has maintained as an active avocation a prominent and busy place in Rotary International. Always he is busy and always occupied with people.

Yet in spite of his outstanding collection of activities of many kinds (which he calls "goat feathers"), Dr. Howe seldom appears to hurry, never bustles, and always has time to do a good turn for any one who needs his help.

Summing up a career of such catholicity of interest and accomplishment is a task of major magnitude. Indeed, it is quite impossible to stop its progress long enough to get more than fleeting glimpses of its many ramifications. Clearly the outstanding achievements of the man and

* Reprinted from *Sci. Monthly*, **15** [4] 381–82 (1942).

editor are to be found in the extraordinary development of the publications under his care. *Industrial and Engineering Chemistry* has grown to occupy under his guidance an outstanding place in the research literature of the world. It has been split into three principal parts, Industrial and Analytical Editions and *Chemical and Engineering News*, each of which is an outstanding publication in its own right and field. The American Chemical Society News Service has, under Dr. Howe's supervision, become a recognized agency for the general dissemination of news about chemistry and the chemical industry to the public at large. The Technological Series of American Chemical Society Monographs has been built by him into a vital and growing library of chemical technology.

Any of these major achievements would merit recognition by a medal. The combination of these and innumerable lesser accomplishments by one man richly deserves the highest accolade.—D. H. KILLEFFER

NOTES AND NEWS

ACCIDENT, SABOTEUR OF MAN POWER

Led by business and industry, America is organizing the greatest counterattack on accidents in all history. Faced by mounting casualties on the home front already exceeding those on the fighting front, the country is at last taking unified action to curb the sabotage of man power by accident.

Since Pearl Harbor, 85,000 persons in all have been killed by accident in the United States and 7,700,000 have been injured (up through November, 1942). Destruction of human material on this grand scale means something more than personal tragedy endlessly repeated. It means that 410,000,000 man-days of work have been lost, which might better have been spent turning out tanks, planes, guns, ships, and the thousand and one complementary materials of war.

Of these fatalities, 42,000 were workers—at a time when man power is the Nation's major nonmilitary concern. Only one out of eight industrial establishments (there are 196,000 in all) is fully covered by a safety program. Even more alarming is the fact that three out of five workers injured were struck down, not in line of duty at furnace, press, or lathe, but off the job.

Whatever the background of our accident-experience, its end effects are a gross waste of skills, serious lapses of efficiency while replacements are trained, and steady impairment of morale. When the trend has reached a pitch where ten firms are required to keep careless Americans supplied with glass eyes and twenty-five more to keep them supplied with crutches, the time is ripe to call a halt.

A halt has been called. The first move was made by the President of the United States in a proclamation calling on the National Safety Council "to mobilize its nationwide resources in leading a concerted and intensified campaign against accidents."

The National Safety Council had thirty years of invaluable experience to draw on. It had plenty of ideas for concrete action. It knew exactly what it would need in the way of increased staff and public cooperation. But to move into wartime high gear with a program big enough to meet the national accident crisis, money for an adequate emergency budget was needed.

At this point, business and industry stepped to the fore. In a spirit of wartime public service, representative leaders decided to undertake the financing of the Council's biggest assignment and organized the War Production Fund to Conserve Manpower. William A. Irvin, former president of the United States Steel Corporation, accepted the national chairmanship of the Fund, and Thomas W. Lamont of J. P. Morgan and Company became treasurer. A goal of $5,000,000 was agreed on, this sum to be raised from business and industry throughout the country.

A national committee of more than 600 members was formed, with an executive committee of 74; both were made up of senior executives in nationally prominent firms. A preliminary canvass through the national connections of major companies has yielded above $1,000,000 in cash and nearly another million in oral commitments. At present, regional campaigns are getting under way in major industrial centers from coast to coast.

Regional committees for obtaining support of companies not accessible through national channels have either been set up or are planned in the following areas: Seattle, Los Angeles, San Francisco, Denver, Minneapolis, Des Moines, Kansas City, Oklahoma City, Ft. Worth, Houston, New Orleans, Birmingham, Atlanta, Winston-Salem, Norfolk, Louisville, Chicago, Milwaukee, St. Louis, Indianapolis, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Baltimore, State of Delaware, Philadelphia, Northern New Jersey, New York City, State of Connecticut, and Boston.

The War Production Fund movement has received the blanket endorsement of President Roosevelt and of Donald M. Nelson, chairman of the WPB. The fund has been expressly approved by the National Association of Manufacturers, the directors of the American and Steel Institute, the Western Association of Railway Executives, the Eastern Railroads Presidents Conference, and by many other important national organizations.

A typical comment on the Fund was made by Joseph A. Moore, president of the Moore Drydock Co., San Francisco, Calif., who spoke as follows in a radio address:

"We have an enormous job to do, and we cannot do it without the support and cooperation of business and industry. Accidents can and must be prevented if we are to mobilize this country for all-out war production. Industry can and must take the leadership in this movement. We are asking for the support of all business. It has been abundantly proved that safety pays off in money, in time, and in war production."

Many big firms have contributed heavily to the War Production Fund despite the fact that they already have excellent safety programs in effect. They are aware that some outside agency with specialized experience is needed to coordinate safety off the job, where three out of five accidents affecting workers happen. They will also welcome technical assistance in handling the brand new problem of safety for the army of women in industry and of safety in the homes temporarily neglected for drill press and assembly bench. The same goes for accident-prevention methods to protect teen-age boys and older men now filling the shoes of men drawn into the armed forces.

The National Safety Council has worked out a careful plan for putting the $5,000,000 to work. No radical departures from previous practice are contemplated. The general strategy will be to speed up the existing program, to get more coverage, more technical assistance in the field, and above all, more public cooperation in accident prevention.

The national aspect of the accident problem is underscored in Council planning—the over-all need as contrasted with an aggregate of scattered needs.

The Council has detailed plans for re-energizing the safety movement in several directions. Cooperative programs to reduce off-the-job accidents will receive serious attention. The hiring of more staff is contemplated. More technical assistance will be furnished plants already having safety programs and will be introduced into the thousands of plants now unprotected. New safety councils will be started in strategic war-production centers, and established councils will get help in expending their activities. Much thought has been given to plans for extending the safety-training programs in public schools, trade schools, and engineering colleges. A great effort will be made to educate the general public in safety, and for this

purpose greater use will be made of the press, magazines, and radio. Methods for handling congested traffic in war-industry centers will be tried out. The problem of handling traffic to facilitate great troop movements is on the Council's agenda. Above all, the collaboration of private and public agencies, the Department of Labor, the Army and Navy, state boards of education, etc., will be sought to create an adequate web of safety control.

The National Safety Council has just entered into its thirty-first year. It is a private organization of 5483 members, some of these corporations and others private individuals, and lately it has operated on an annual budget of $1,000,000. The Council's finances are controlled by a nonpaid board of trustees recruited from the management of leading corporations. The president of the Council is Colonel John Stilwell, vice-president of the Consolidated Edison Co., New York, N. Y. Ned A. Dearborn, executive vice-president and managing director, heads a staff of 144 members. Home offices are in Chicago.

In a recent address before the National Safety Congress in Chicago, William A. Irvin, the Fund's national chairman, spoke as follows:

"In terms of its importance to the war effort and in terms of its day-by-day social and economic significance to the Nation, the safety movement is ten times as important as many other movements that get ten times its public recognition and support."

Stiffened by this conviction, business and industry through the War Production Fund have started something that will almost certainly carry over into peacetime and cannot help but initiate urgently needed disciplines guaranteeing greater wartime efficiency.

DOLOMITE SURVEY

A survey of the high-grade dolomite deposits of the United States has been completed by the U. S. Bureau of Mines in response to an increasing demand for dolomite as a source of magnesium and for dolomite refractories used in metallurgical furnaces.

The outstanding deposits of thirty-seven states in various sections of the country are described in the Bureau's new Information Circular No. 7226 entitled "High-Grade Dolomite Deposits of the United States" by John H. Weitz. Based on the Bureau's own records, published information, and correspondence, it gives information on the location, extent, thickness, workability, and chemical composition of the dolomite deposits and includes analyses of more than 1000 samples, together with a map showing locations of the deposits.

The Circular may be obtained free of charge from the U. S. Bureau of Mines, Department of the Interior, Washington, D. C.

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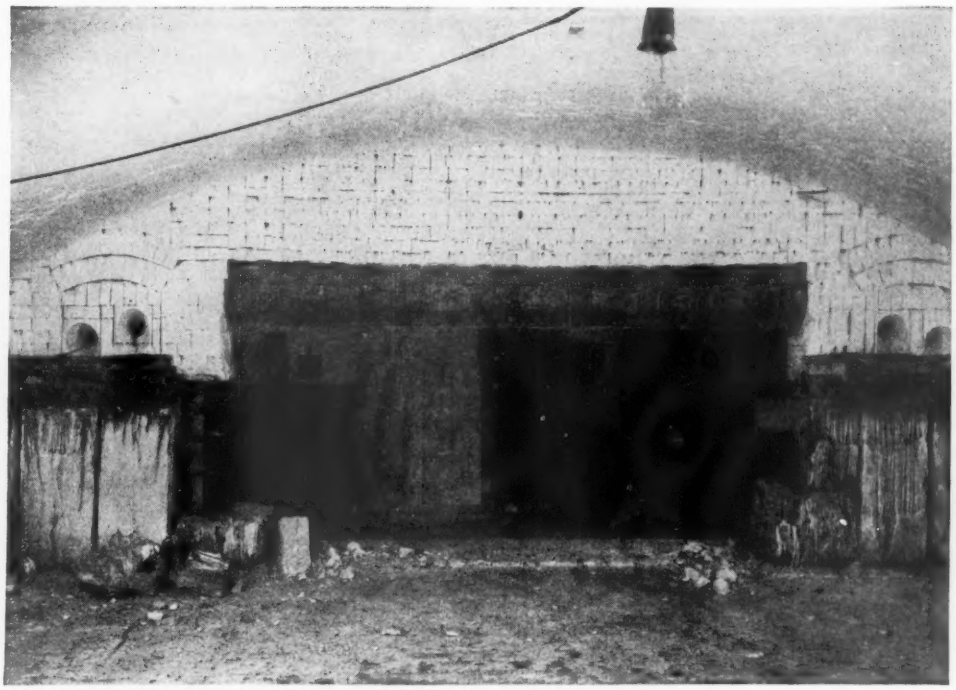

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The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.

Clay (Wad)
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay (Wall Tile)
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Cleaners
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
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Clocks (Gauge Board)
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Cobalt Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
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Cobalt Sulphate
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Colors
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Porcelain Enamel and Mfg. Co.
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Cone Plaques
Industrial Ceramic Products, Inc.

Cones
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Conveying Equipment
Frazier-Simplex, Inc.
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Corhart
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Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
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Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

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Forester Firing System

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The Vitro Mfg. Co.

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The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
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Glaze Spar
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	Ferric oxide (Fe_2O_3)	0.55
	Lime (CaO)	0.00
	Magnesia (MgO)	0.00
	Alkalis (Na_2O,K_2O)	0.00
Mechanical Composition	—20 microns	98.00%
	—10 "	80.98
	— 6 "	70.94
	— 3 "	54.70
	— 1 "	37.74
	— 0.5 "	21.75

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Norton Co.

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The Vitro Mfg. Co.

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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
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Thomas Alabama Kaolin Co.
The Vitro Mfg. Co.

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Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Talc
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
International Pulp Company

Tanks
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
The Hommel, O., Co., Inc.

Tanks for Raw Material Steel or Concrete
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile Setter Pins
Louthan Mfg. Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co.
Thomas Alabama Kaolin Co.

Tile (Wall)
Denver Fire Clay Co.
Thomas Alabama Kaolin Co.

Tin Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Drakenfeld, B. F., & Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Trisodium Phosphate
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
Louthan Mfg. Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Norton Co.

Uranium Oxide
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Uranium Oxide (Yellow-Orange-Black)
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Zircon
Foote Mineral Co.
The Hommel, O., Co., Inc.

Zirconia
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

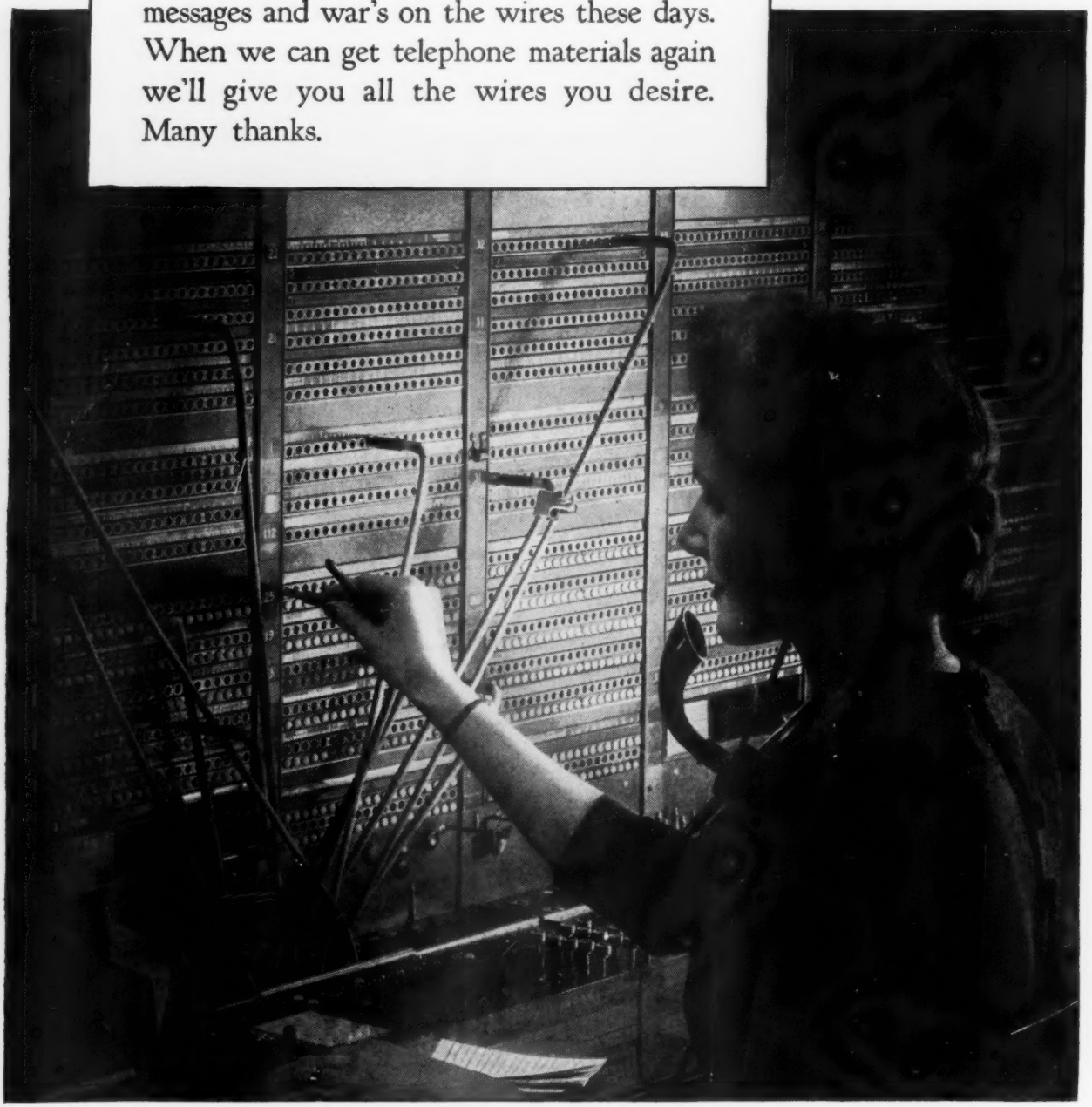
Zirconium Oxide
Foote Mineral Co.
The Hommel, O., Co., Inc.
Titanium Alloy Mfg. Co.

Zirkite (Natural ZrO_2)
Foote Mineral Co.

"AN URGENT CALL FOR YOU"

"Please do not make Long Distance telephone calls to war-busy centers unless it is really necessary."

That helps keep the lines open for war messages and war's on the wires these days. When we can get telephone materials again we'll give you all the wires you desire. Many thanks.



BELL TELEPHONE SYSTEM

H. C. SPINKS CLAY COMPANY
Miners and Shippers of
BALL, SAGGER AND WAD CLAY
NEWPORT, KY.

January 1, 1943

OUR NEW YEAR'S BEST WISHES

In the past all of us have at this time of the year given thought to the prospective profits we might make during the coming twelve months and the improved technique and additional stability we hoped to build into our respective companies and organizations. In true American manner we wished our friends and associates good luck and success, and too, looked forward to the friendships that we hoped we would gain through the year's business contacts.

This year all of us have but one thought: to do all we can to win this war, and our hope that we will win quickly, decisively and at the lowest possible cost in life and blood.

One way that we think we can help is by continuing to supply you with the best possible quality SPINKS CLAYS.

H. C. SPINKS CLAY COMPANY

With your new chemical problems

The conversion of a plant to war production creates a need for unfamiliar chemicals and unaccustomed processes . . . when you make the change-over you can secure those chemicals, even the common garden variety . . . from Harshaw.

This is a good thing to know when you have the thousand and one headaches involved in such a change.

More than that, you can count on technical assistance and information, for Harshaw's business is industry-wide, distribution and service facilities nation-wide.

Harshaw can probably help

The Harshaw Chemical Co., Cleveland and Principal Cities